

## MEMBER FOR PUSH-BUTTON SWITCH AND MANUFACTURING METHOD THEREFOR

Publication number: JP2002367469

Publication date: 2002-12-20

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Classification:

- International: H01H9/18; H01H11/00; H01H13/02; H01H13/14; H01H13/70;  
H01H9/18; H01H11/00; H01H13/02; H01H13/14; H01H13/70;  
(IPC1-7): H01H13/02; H01H9/18; H01H11/00; H01H13/14;  
H01H13/70

- european:

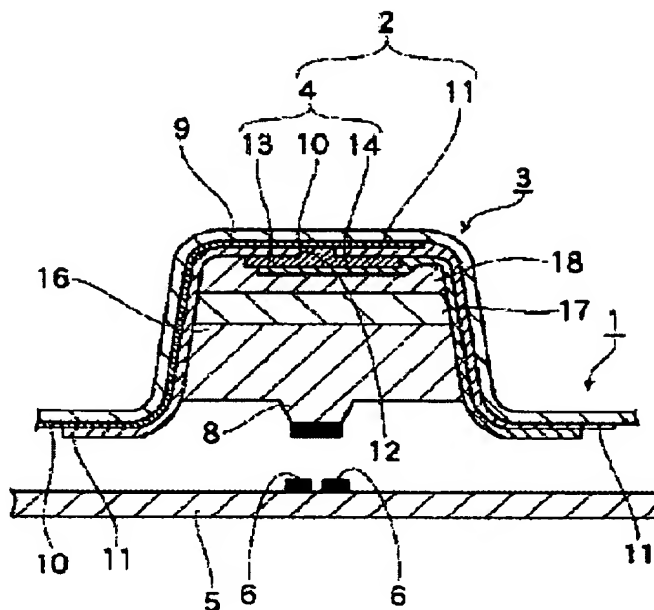
Application number: JP20010175768 20010611

Priority number(s): JP20010175768 20010611

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#### Abstract of JP2002367469

**PROBLEM TO BE SOLVED:** To provide a thin and light-weight member for a push-button switch, by using a planar illuminant capable of realizing illumination of a display part, which has no luminance irregularities while restraining consumption power by effectively using light energy for the illumination of the display part, and which is driven by a direct current, and to provide its manufacturing method. **SOLUTION:** This member 1 for a push-button switch has a key top part 3 for pressing a moving contact 7 disposed opposite to fixed contacts 6 on a circuit board 5, in a direction of contacting it with the fixed contacts 6, and a cover base material for disposing and mounting the key top part 3 at a predetermined position on the circuit board 5, and has the planar illuminant 4 integrated with a display part 2 for displaying switching function in the key top part 3. An electrochemical illuminant is used for the planar illuminant 4.



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## CLAIMS

## [Claim(s)]

[Claim 1] The keytop section for pressing the traveling contact which counters the stationary contact on the circuit board and is arranged in the direction contacted to said stationary contact, It has a covering base material for allotting this keytop section to a position and attaching on said circuit board. In said keytop section The member for a push button switch characterized by being the member for a push button switch which has the field illuminant of one in the display which displays a switch function, and this display, and said field illuminant being an electrochemical luminescence object.

[Claim 2] It is the member for a push button switch according to claim 1 characterized by for said keytop section having the transparence insulation film which covers a core material and this core material, and for said field illuminant having an illuminant layer between a base electrode and the transparent electrode which counters this base electrode, and having extended and arranged the electrode terminal of said base electrode, and the electrode terminal of said transparent electrode to parts other than said keytop section.

[Claim 3] The member for a push button switch according to claim 2 characterized by being conductive ink in which said base electrode consists of a conductive particle and insulating resin.

[Claim 4] Said transparent electrode is a member for a push button switch according to claim 2 characterized by coming to form a transparent conductive polymer layer in a transparence insulation base, and forming said luminous layer object in contact with this transparent electrode.

[Claim 5] The member for a push button switch according to claim 4 characterized by coloring said transparent conductive polymer layer.

[Claim 6] Claim 1 characterized by forming the inorganic oxide layer in a part of outside surface [ at least ] of said member for a push button switch thru/or the member for a push button switch of any one publication of five.

[Claim 7] The member for a push button switch according to claim 6 characterized by coming to prepare an organic layer in the outside surface of said inorganic oxide layer.

[Claim 8] The member for a push button switch according to claim 6 or 7 characterized by being the thing into which said inorganic oxide layer comes to convert polysilazane.

[Claim 9] Claim 6 characterized by preparing a moisture absorption layer between said base electrodes and cores of said keytop section thru/or the member for a push button switch of any one publication of eight.

[Claim 10] The member for a push button switch according to claim 9 characterized by preparing an oxygen uptake layer between said base electrodes and cores of said keytop section.

[Claim 11] The manufacture approach of the member for a push button switch characterized by having been formed in the conductive ink in which it is the manufacture approach of claim 1 thru/or the member for a push button switch any one publication of ten, and said base electrode consists of a conductive particle and insulating resin, and carrying out size enlargement of this conductive ink in the state of plastic flow.

[Claim 12] The manufacture approach of the member for a push button switch characterized by coming to carry out size enlargement of the keytop section and the electrode terminal area after forming at least three sorts in the coloring layer which be the manufacture approach of claim 1 thru/or the member for a push button switch any one publication of ten , and constitute the encaustic section or the ground section of said illuminant layer , said transparent electrode , said base electrode , or said display on a plane transparence insulation film .

[Translation done.]

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]****[0001]**

**[Field of the Invention]** This invention is used for input devices, such as personal digital assistants, such as a cellular phone and PDA, telephone, a car stereo, a board computer for mount, an audio, a measuring instrument, a personal computer, and remote control for home theaters, and or it identifies each in the keytop section of this input device, it relates to the member for a push button switch and its manufacture approach of the illumination type which can begin to illuminate a display in more detail in a dark place about the member for a push button switch which has the display which displays a switch function.

**[0002]**

**[Description of the Prior Art]** Conventionally, the so-called illumination function in which the member for a push button switch used for this kind of input device illuminates the display which showed the function of a push button switch in the activity at the time of night is needed.

**[0003]** For example, it is incorporated in the case of the input device made into the object, and enables it to realize the switch function of the push button switch 30 with the push button switch 30 used for input devices, such as a portable telephone, after the covering base material 32 and the circuit board 33 which formed in one two or more keytop sections 31 which constitute an actuation key have faced each other as shown in drawing 14 or drawing 15 . and in the top panel section of the becoming [ each actuation key ] keytop section 31, or the rear-face section, so that the function of the push button switch 30 may be known even in a dark place The display 34 which displayed an alphabetic character, a sign, or a pattern according to each switch function etc. is formed. The content of a display of a display 34 emerges and it can check by looking now because the reflected light which the direct solar radiation emitted from the light source of LED35 or electric bulb 36 grade established on the circuit board 33 and this direct solar radiation reflect and produce in a surrounding member penetrates in the top panel section from the rear-face section of the keytop section 31. Thereby, a cellular phone etc. can be used convenient also in the time of night.

**[0004]** Moreover, when more uniform brightness was required, as shown in drawing 16 or drawing 17 , the light guide section material 37 on sheet metal was inserted between LED35 and the keytop section 31, and to enlarge luminescence surface area by using the EL (electroluminescence) sheet 38 which carries out field luminescence as the light source was tried.

**[0005]** However, the light guide section material 37 which draws the direct solar radiation from the light source and the light source of LED35, an electric bulb 36, and EL sheet 38 grade Since it is arranged in the place distant from the keytop section 31 so that contact actuation with the contact surface 39 on the circuit board 33 and the keytop section 31 may not be checked, It becomes the physical relationship which the light sources 35, 36, and 38, the light guide section material 37, and a display 34 left. If it is when carry out, it compensates the light guide section material 37 or the EL sheet 38 is used, an increase and, the number of LED35 or electric bulbs 36 The case where sufficient quantity of light which checks the content of a display of a display 34 in a dark place could not be supplied although the difficulty of the design by components mark increasing becomes high arose, and it was lacking in the effectiveness.

**[0006]** If it was in the portable telephone which carries out cell actuation especially, the low power is called for, to secure sufficient quantity of light by a small number of light sources was desired, but by the conventional approach mentioned above, even if a part of light emitted from the light source could contribute on the check-by-looking disposition of a display 34 but it used big power consumption, conflict that it could not improve had produced visibility.

**[0007]** Furthermore, weight increase was to be caused while constraint arose to be unable to make thickness of the push button switch 30 thin, as a result make thin thickness of an input unit or the body of a device, in order to form the light sources 35, 36, and 38 and the light guide section material 37 between the keytop section 31 and the contact surface 39 prepared in the fixed substrate 33 corresponding to this.

**[0008]**

**[Problem(s) to be Solved by the Invention]** Then, in order to cancel the above nonconformities, that to which the device which prevents diffusion of light and loss of the quantity of light by the obstruction by preparing the field emitter which carries out spontaneous light to the top panel section of the keytop section like invention indicated by JP,11-232954,A or JP,2000-285760,A, and attaching the light source near the display is performed is known.

**[0009]** And into a high dielectric organic substance, since these field emitters are organic distributed process input output equipment EL (inorganic [ EL ]) which distributed inorganic emitter powder, they are impressing the alternating current for actuation.

**[0010]** Moreover, although a transparent electrode, a display, or the 2nd electrode is beforehand prepared on a transpance insulation base and it fabricates by spinning etc. since a display is located in the top panel section of the keytop section, a transpance insulation base follows on being extended, an electrode material etc. is extended, and the device which suppresses lifting of the resistance of a transparent electrode is made. However, since the device which owns only DC power supplies, such as a personal digital assistant, since organic distributed process input output equipment EL (inorganic [ EL ]) is being used for the conventional member for a push button switch to which these displays emit light had to carry out conversion into ac of this, it had to carry out pressure up further and it needed an excessive component and its tooth space, it has been used only for the limited product. Furthermore, since it is driving by the alternating current, there are an oscillation and generating of a noise and nonconformities, such as displeasure and communication failure, have arisen in the activity in the cellular phone.

[0011] Moreover, although the low power was called for more especially in the personal digital assistant which carries out cell actuation also in energy, it was low, and electric - light conversion efficiency was also bringing the life of a cell forward, and was user-unfriendly. [0012] Furthermore, since the transparent electrode which a transparence electric conduction ceramic layer is prepared [ transparent electrode ] by sputtering, or makes an organic binder come to distribute expensive powder is used, resistance becomes very large at the time of shaping, and since an electrode material has the disadvantageous nonconformity that a display does not light up, it has not reached the level of practical use industrially.

[0013] Then, it thinks in order to solve the problem of the member for a push button switch which illuminates the display of the above conventional keytop sections, this invention is use light energy for illumination of a display without futility, though power consumption is press down, it can realize illumination of a display without brightness unevenness, and it makes it a technical problem to offer the thin and light member for a push button switch and its manufacture approach of thickness by use the field illuminant drive by direct current.

[0014]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, invention according to claim 1 The keytop section for pressing the traveling contact which counters the stationary contact on the circuit board and is arranged in the direction contacted to said stationary contact, It has a covering base material for allotting this keytop section to a position and attaching on said circuit board. In said keytop section It is the member for a push button switch which has the field illuminant of one in the display which displays a switch function, and this display, and is characterized by said field illuminant being an electrochemical luminescence object.

[0015] invention according to claim 2 — the configuration of claim 1 — in addition, said keytop section has the transparence insulation film which covers a core material and this core material, said field illuminant has an illuminant layer between a base electrode and the transparent electrode which counters this base electrode, and it is characterized by having extended and arranged the electrode terminal of said base electrode, and the electrode terminal of said transparent electrode to parts other than said keytop section.

[0016] In addition to the configuration of claim 2, invention according to claim 3 is characterized by being conductive ink in which said base electrode consists of a conductive particle and insulating resin.

[0017] As for said transparent electrode, in addition to the configuration of claim 2, invention according to claim 4 is characterized by coming to form a transparent conductive polymer layer in a transparence insulation base, and forming said luminous layer object in contact with this transparent electrode.

[0018] In addition to the configuration of claim 4, invention according to claim 5 is characterized by coloring said transparent conductive polymer layer.

[0019] invention according to claim 6 — claim 1 thru/or 5 — any one configuration — in addition, it is characterized by for the outside surface of said member for a push button switch boiling a part at least, and forming the inorganic oxide layer.

[0020] In addition to the configuration of claim 6, invention according to claim 7 is characterized by coming to prepare an organic layer in the outside surface of said inorganic oxide layer.

[0021] invention according to claim 8 — claim 6 or the configuration of 7 — in addition, said inorganic oxide layer is characterized by being the thing which comes to convert polysilazane.

[0022] In addition to claim 6 thru/or any one configuration of 8, invention according to claim 9 is characterized by preparing a moisture absorption layer between said base electrodes and cores of said keytop section.

[0023] In addition to the configuration of claim 9, invention according to claim 10 is characterized by preparing an oxygen uptake layer between said base electrodes and cores of said keytop section.

[0024] Invention according to claim 11 is the manufacture approach of claim 1 thru/or the member for a push button switch any one publication of ten, is formed in the conductive ink in which said base electrode consists of a conductive particle and insulating resin, and is characterized by carrying out size enlargement of this conductive ink in the state of plastic flow.

[0025] Invention according to claim 12 is the manufacture approach of claim 1 thru/or the member for a push button switch any one publication of ten, and after it forms at least three sorts in the coloring layer which constitutes the encaustic section or the ground section of said illuminant layer, said transparent electrode, said base electrode, or said display on a plane transparence insulation film, it is characterize by come to carry out size enlargement of the keytop section and the electrode terminal area.

[0026]

[Embodiment of the Invention] Hereafter, drawing 1 thru/or drawing 13 explain the gestalt of implementation of this invention.

[0027] [Gestalt 1 of implementation of invention] drawing 1 is the important section sectional view having shown the member for a push button switch concerning the gestalt 1 of implementation of this invention.

[0028] The member 1 for a push button switch concerning the gestalt 1 of operation shown in drawing 1 forms the display 2 which displayed the switch function with an alphabetic character, a sign, or a pattern in the top panel section side of the keytop section 3, and the field emitter 4 which carries out spontaneous light to a display 2 is used for it.

[0029] The traveling contact 7 which is made to counter the stationary contact 6 on the circuit board 5, and is arranged is formed in the member 1 for a push button switch concerning the gestalt 1 of operation. A traveling contact 7 is specifically formed at the head of the press projected part 8 prepared in the center of the rear-face section of the keytop section 3, and the traveling contact 7 enables it to contact to a stationary contact 6 by pressing the keytop section 3 to a circuit board 5 side.

[0030] It is the periphery section of the keytop section 3. Moreover, between the member 1 for a push button switch, and the circuit board 5 When the covering base material (not shown) of spring materials, such as silicone rubber which formed in one two or more keytop sections 3 allotted to the position, is formed and the keytop section 3 is pressed, some covering base materials carry out elastic deformation to a circuit board 5 side. When a hand is lifted from the keytop section 3, the keytop section 3 enables it to return to the original location according to the elastic stability of a covering base material.

[0031] Two or more keytop sections 3 are arranged by the need, it has the complicated configuration of a three dimension from points, such as an ERUGONOMIKKU design, in many cases, the top panel section of the keytop section 3 serves as the configuration where it upheaved from parts other than keytop section 3, and the member 1 for a push button switch projects from opening (not shown) prepared in the case of an input unit. As for a display 2, that with which a figure, an alphabetic character, or a pattern is adopted and indicates the discernment function of the keytop section 3 or the switch symbol description of the keytop section 3 to be is used. Although these displays 2 are identified according to the color difference of for example, an alphabetic character color (encaustic section) and background colors other than an alphabetic character (ground section), a hue with sufficient visibility will be chosen if

needed.

[0032] For example, a switch function can be made easier to be able to distinguish actuation of the keytop section 3 which has two or more displays 2, such as a figure and the alphabet, in the one keytop section 3, and has many functions by changing this and making light emit with the separate luminescent color, and to operate it. Although it is illuminated for an input check in order that a display 2 may raise the visibility in a dark place or, the design, such as an alphabetic character illuminating, or a background illuminating, or illuminating both an alphabetic character and a background, is determined freely. Although the brightness of illumination changes with luminescent color, it is ten to 100 nit (nt) about.

[0033] The ingredient of the core material 22 of the keytop section 3 which determines the substantial configuration of the keytop section 3 is chosen from hard, elasticity resin, or an elastomer. Although thermoplastic or thermosetting any are sufficient and it is not limited to the shape of a film, a pellet type, and the gestalt of liquefied \*\*\*\*\*, liquefied thermosetting resin is easy to pour in and it is desirable.

[0034] The transparence insulation film 9 is covered by the periphery front face of the member 1 for a push button switch except the rear-face section of the keytop section 3, and the transparent electrode 10 used as one electrode of the field emitter 4 is formed in it in the rear face of this transparence insulation film 9 in the range which reaches the top panel section of the keytop section 3 from the side face of the keytop section 3. The opaque coloring layer 11 which has protection-from-light nature and insulation is formed in the rear face of the transparence insulation film 9 in which the rear face of a transparent electrode 10 and the transparent electrode 10 are not formed.

[0035] And the cutting die section 12 doubled with gestalten, such as an alphabetic character of a display 2, a sign, or a pattern, is formed in the opaque coloring layer 11. The emitter layer 13 of magnitude slightly smaller than the magnitude of the top panel section of the keytop section 3 including the cutting die section 12 is formed in the rear face of the opaque coloring layer 11. Therefore, the cutting die section 12 will be fill uped with the emitter layer 13, the pattern [ that it consists of an alphabetic character, a sign, or a pattern ] section will be formed, and the design of a display 2 will be completed by the ground section which consists of an opaque coloring layer 11 around this encaustic section and the cutting die section 12. And the base electrode 14 which forms another electrode is formed in the rear face of the illuminant layer 13.

[0036] Moreover, as the oxygen uptake layer 18 and the moisture absorption layer 17 lap between the rear face of a base electrode 14 and the opaque coloring layer 11, and the core material 22 of the keytop section 3, they are formed in it. The emitter layer 13 is protected from oxygen and humidity, and it enables it to maintain the quality by this at a long period of time.

[0037] That to which the structure where display 2 the very thing emits light consists of a LEC (Light Emitting Electrochemical Cell, electrochemical luminescence) object with easy compound-izing with the Plastic solid of resin by making homogeneity emit light, and carries out visible luminescence of the field of a display 2 directly, the thing which carried out ultraviolet luminescence light outside and changed this into visible luminescence are contained.

[0038] LEC is the structure where one side [ at least ] which counters made the about 0.5-50-micrometer emitter layer 13 pinch among 2 electrodes (a transparent electrode 10 and base electrode 14) of transparence. The illuminant layer 13 The poly thiophene, polyphenylene, polyphenylene vinylene, With derivatives, such as polypyrrole, polyacethylene, and the poly vinylene, a conjugation polymer, and oligomer, or laser coloring matter etc. and ethyleneoxide, FOSUFAZEN, propylene oxide, dimethylsiloxane, oxy-methylene, EPIKUROROHIDORAN, oxetane, a tetrahydrofuran 1, 3-dioxolane, Metal salts, such as a lithium triphloromethanesulfonate salt, are mixed with the electrolyte matter of polymers, such as ECHIRENIMIN, ethylene succinate, ethylene sulfonate, oxyethylene methacrylate, and oxyethylene cyclo tris phosphazene, or oligomer. In addition, the salt which consists of organic acids, such as inorganic acids, such as alkali metal, an alkaline earth metal, aluminum, silver, copper, cobalt, zinc, ammonium, tetramethylammonium, phenyl ammonium, etc. a halogen and perchloric acid, a nitric acid, a sulfuric acid, phosphoric acid, and a boric acid, a truffe ROROME tongue sulfonamide and an acetic acid, toluenesulfonic acid, a salicylic acid, and a benzoic acid, is mentioned.

[0039] In order to change into the condition that the cation of a previous salt and an anion can move the inside of an electrolyte to mixing, Although dissolution mixing is carried out with a simple substance or mixed solvents, such as toluene, pill gin, an acetonitrile, octyl cyano acetate, a cyclohexanone, alcohols, and water, in order [ whose magnitude of nothing and a cel is about 10-100nm ] to form reticulated, a conjugation polymer and an electrolyte a phase The compatibility of a solvent, an electrolyte and a solvent, a conjugation polymer, and an electrolyte and a conjugation polymer is important.

[0040] If the electrical potential difference of 3-6V of a direct current is impressed to a transparent electrode 10 and a base electrode 14, the cation of a salt and an anion will move to cathode and an anode plate, respectively, and will carry out electrochemistry doping of the nearby conjugation polymer. Consequently, P type and an N-type semiconductor will be electrochemically generated with sufficient balance, an electron or an electron hole will be efficiently supplied to a conjugation polymer, and light is emitted (for example, WO 96/00968).

[0041] Thus, LEC has that structure is simple and the description that thickness control is easy and a low power.

[0042] Although the luminescent color of emitter layer 13 the very thing can also be used for a display 2, the color of the request of those other than the luminescent color can be chosen between the emitter layer 13 and a transparent electrode 10 by coloring transparent electrode 10a which colored the transparent electrode 10 which touches the transparence coloring layer 15 prepared on the base which supports a transparent electrode 10, or the emitter layer 13. What changes the wavelength itself can be used for the transparence coloring layer 15 using color conversion coloring matter, such as coloring matter which penetrates request wavelength, such as an azo pigment used for a light filter, a nitroso pigment, a nitro pigment, and an alizarin lake, and benzopyranon, a kino lysine, ethyl pyridinium perchlorate, an ethyl bends oxazolium perchlorate derivative. a long wave with color conversion low [ the high short wavelength of energy ] — changing into merit is efficient.

[0043] Next, the manufacture approach of the member 1 for a push button switch concerning the gestalt 1 of operation is explained.

[0044] In first, the part in which the even transparence insulation film 9 is made into the bottom, and the keytop section 3 of this transparence insulation film 9 is located The band-like transparent electrode 10 almost equal to the width of face of the top panel of the keytop section 3 is formed. By performing negative printing in the opaque coloring ink which has protection-from-light nature and insulation from on this transparent electrode 10 centering on the part applicable to the top panel section of the keytop section 3 The opaque coloring layer 11 of sufficient magnitude for a wrap is formed for the periphery front face of the member 1 for a push button switch except the rear-face section of the keytop section 3. Under the present circumstances, the cutting die section 12 which modeled the configuration of the encaustic section of the display 2 which displayed the switch function is formed in the part in which

the top panel section of the keytop section 3 of the opaque coloring layer 11 is located.

[0045] Next, on the opaque coloring layer 11, luminescent material is printed in magnitude slightly smaller than the magnitude of the top panel section of the keytop section 3 including the cutting die section 12, and the emitter layer 13 is formed. Thereby, the cutting die section 12 is filled up with the emitter layer 13. Furthermore, the printed sheet before size enlargement processing (not shown) is completed by forming the base electrode 14 of the almost same magnitude as the illuminant layer 13 on the illuminant layer 13, and making it the illuminant layer 13 stop at the cutting die section 12 of the opaque coloring layer 11.

[0046] Formation of the encaustic section of a display 2, \*\*\*\*, and opaque coloring layer 11 grade should just perform the usual transparence and opaque ink using technique, such as screen-stencil, ink jet printing, hot printing printing, gravure, spray painting, DIP coating, spin coating, and vacuum evaporation. Moreover, the color of a printing base can also be used as it is.

[0047] Next, size enlargement processing which set the printed sheet before size enlargement processing mentioned above by the configuration of the desired keytop section 3 by the compressed air and the vacuum forming, press forming, etc. is performed, and the size enlargement sheet which has the crevice in which the core material 22 of the keytop section 3 is formed is created. At this time, the flection of a transparent electrode 10 needs to secure sufficient radius of circle so that the resistance of a transparent electrode 10 and a base electrode 14 may not change a lot.

[0048] Next, after forming the moisture absorption layer 17 which touches the oxygen uptake layer 18 and this oxygen uptake layer 18 in contact with a base electrode 14 in the crevice of the size enlargement sheet fabricated by size enlargement processing, the thermosetting resin which serves as a core material 22 from on that is poured in, and it is made to harden within metal mold. Then, the member 1 for a push button switch which forms a traveling contact 7 at the head of the press projected part 8 of the keytop section 3 by applying conductive ink, and starts the gestalt 1 of operation is completed.

[0049] A transparence conductive layer can be formed in what carried out injection molding of the transparence insulation Plastic solid which became a request configuration, for example, the acrylic resin, as a transparent electrode 10 for SERAMMIKU, such as tin oxide, indium oxide, and a zinc oxide, by technique, such as electron beam evaporation, ion plating, and sputtering. Or the transparent conductive ink which mixed the particle of a ceramic in the transparence insulation resin solution can be formed by the general printing methods of application, such as screen-stencil, gravure, ink jet printing, spray coating, DIP coating, and spin coating. Or the resin compound which mixed the particle of the above mentioned ceramic to transparence insulation resin may be fabricated directly. About, the surface electrical resistance is 10-3000ohm/\*\*, and light transmission is 50 - 90%.

[0050] Although it is also possible to form a transparent electrode 10 on the Plastic solid (core material) beforehand fabricated by the request configuration When control of thickness etc. is taken into consideration from the facilities on industrial utilization, it is desirable to prepare a transparence conductive layer on the transparence insulation film 9 beforehand. Polyvinyl alcohol, polyethylene whose thickness is about 25-500 micrometers, Polyethylene terephthalate, polyethylenenaphthalate, the poly acrylic, A polycarbonate, polystyrene, poly FURORO ethylene propylene, Poly chloro TORIFURORO ethylene, the poly vinylidene, polyimide, polyamidoimide, Polyether sulphone, polysulfone, polyphenylene sulfide, Double \*\*\*\* which carried out the lamination of several sorts besides denaturation objects, such as a polyamide, polyarylate or a styrene system, a polyester system, a polyamide system thermoplastic elastomer, and those copolymerization objects, an alloy, of films can be used.

[0051] If extended by the processing method which the transparence insulation film 9 mentions later, since the transparent electrode 10 which is a transparence conductive layer is also set and extended, conductivity will fall, but since the transparent conductive ink which used the same resin as the transparence insulation film 9 as the binder has adhesion or the near working characteristic, it is desirable. Furthermore, since a chain tends to break easily to 50% or more of Plastic solid, the conductive polymer whose very thing itself is conductivity has a rate of a drawing dramatically convenient although the transparent conductive ink which distributed the conductive filler brings about conductivity by the chain of a conductive filler.

[0052] These conductive polymers Polyacethylene, poly para-phenylene, polypyrrole, The poly thiophene, the poly aniline, polyphenylene vinylene, poly seleno FEN, The poly azulene, the poly pyrene, the poly carbazole, the poly pyridazine, poly naphthylene, The polyethylene dioxythiophene which introduced substituents, such as the poly fluorenes, those alkylation, and alkoxy-izing, Poly thienylene vinylene, Pori (3 methylthiophene), Pori (3, 4-dimethylthiophene), Pori (3-thiophene-beta-ethane sulfo nail), the poly methyl pyrrole, Conjugated-system conductive polymers, such as Pori (it is a KISHIRU pyrrole to 3), Pori (3-methyl-4-pyrrole carboxylic-acid methyl), poly cyano phenylenevinylene, a poly dimethoxy phenylenevinylene derivative, or a polyisoprene conversion object, are mentioned.

[0053] Among these, although it has the influence of a dopant, it is extremely stable to oxygen or humidity, and it is transparent and polypyrrole and the poly thiophene with high conductivity, and the poly aniline derivative are desirable.

[0054] Since resistance sufficient in a conductive polymer simple substance cannot be obtained, it is necessary to dope. As an acceptor, halogens, such as iodine and a bromine, PF5, AsF5, the Lewis acid of BF3 grade, HF, HCl, proton acid and Para toluenesulfonic acid of H2SO4 grade, Organic acids, such as PARAMETOKISHI ethyl toluenesulfonic acid, FeCl3, the transition-metals compound of TiCl4 grade, The alkali-metal earth, such as alkali metal as an organic substance or donors, such as tetracyano dimetan, tetracyano tetraaza naphthalene, and chloranil, such as Li, Na, and K, and calcium, Sr, Ba, etc. is mentioned.

[0055] In order to raise the stability by humidity and temperature, an electrolyte anion and a cation are avoided, caution is required for a dedope and coordinate bond, copolymerization, etc. with a conductive polymer are [ it is / direction / good and ] an effective approach to immobilization. Especially the thing for which oligomer, such as DIN DORIMA which was made to carry out sequential association from a core molecule by considering as a start raw material, and was compounded [ monomer / of AB2 mold ] in the dopant, polystyrene, polymethylmethacrylate, and polyurethane, a polymer, or a fullerene molecule is introduced into a functional group, and this is supported is simple, and it is especially desirable from the adhesion to a transparence insulation Plastic solid or a film increasing. Moreover, since the dopant which became many organic functions focusing on such support also becomes carrying out the bridge of between conductive polymer molecules, stabilizing in electric conduction, and lowering resistance, it is dramatically useful. It is better to make it store into a Plastic solid, since the effect of a dedope becomes very small where a conductive polymer is closed.

[0056] Furthermore, in order to reduce conductivity, a conductive polymer is extended, it is useful to contract the intermolecular distance of a conductive polymer, and it can use the drawing at the time of size enlargement.

[0057] Although a conductive polymer has the chemical polymerization method which carries out the polymerization of the precursor monomer using an oxidizer or a catalyst, a method of heat-treating and obtaining the intermediate field which consist of a disconjugation polymer, or the electrolytic polymerization method which oxidizes or returns and carries out the polymerization of the



aromatic compound electrochemically as a monomer, it is not limited to this.

[0058] On the transparence insulation film 9, it can form by the general printing method of application in the state of a condition or the dispersed emulsion which prepared the low-molecular article of a conductive polymer by vacuum evaporatio no etc., or was dissolved in water or a solvent. The thickness is about 0.1-25 micrometers about. In the case of a conductive polymer, even if there are much thickness and resistance and a non-ohmic \*\*\*\*\* case thickens them, the resistance reduction corresponding to it is not obtained in many cases, and light transmission only worsens. Therefore, it is necessary to determine required thickness beforehand.

[0059] Although it is also possible to form the display 2 to which itself emits light on an opaque electrode, to form a transparence conductive layer by the technique further mentioned above, and to form the overcoat layer 16 for protection if required, to give the coat which has sufficient engine performance, in order to protect the emitter layer 13 sensitive to humidity etc., for example, to prepare resin with low moisture vapor transmission thickly is desired.

[0060] When using a transparent electrode (transparence conductive layer) 10 for the rear face of the transparence insulation film 9 and the transparence insulation film 9 is carried out outside, a display 2 can be protected with the continuous transparence insulation film 9, it is simple, and usefulness is high. For example, when using the luminescent color as it is, it is attained by preparing in order of the transparence insulation film 9, the opaque coloring layer 11, a transparent electrode (transparence conductive layer) 10, and the emitter layer 13.

[0061] When using colors other than the luminescent color, it is attained by preparing in order of the transparence insulation film 9, the opaque coloring layer 11, coloring transparent electrode 10a, and the emitter layer 13 etc. coloring transparent electrode 10a — the binder of a conductive polymer or transparent conductive ink — organic coloring matter — small quantity — in addition, it can make.

[0062] From an ERUGONOMIKKU design, the design of the complicated three-dimensional structure is required and size enlargement of the member 1 for a push button switch is carried out by the shaping approaches, such as a vacuum forming, blow molding, and press forming. The height of the square pole with which the configuration of a Plastic solid has the cross section whose magnitude of 5-30mm and the keytop section 3 key pitch is 3-20mm about or a cylinder, and the keytop section 3 is 2-15mm. Although there are many in which the top panel section of the keytop section 3 also has curvature, applying excessive flow stress to the display which emits light should avoid.

[0063] A display 2 is near the top panel section of the keytop section 3, and since the part of members 1 for a push button switch other than keytop section 3 is laid or stuck on the fixed substrate 5, it is carrying out the flat-surface configuration.

[0064] Especially at the time of size enlargement, since the side face of the keytop section 3 is extended, the transparence insulation film 9 and a transparent electrode (transparence conductive layer) 10 must be the ingredients suitable for this, and a thing without fracture or resistance lifting is chosen. A conductive polymer is an ingredient suitable for this, can form thickly the conductive polymer around the display 2 especially with the high rate of a drawing, and can suppress resistance lifting. When the side face of the background (ground section) of a display 2 or the keytop section 3 is opaque, compensating in the conductive ink mentioned later is also possible. However, when too much drawing which exceeds 100% is performed, there is a possibility that resistance may go up about 10 times. In this case, conductivity is maintainable when a wire size mixes detailed conductive fiber 0.5 micrometers or less to a conductive polymer. As for the aspect ratio of the conductive fiber in this case, 50 or more are [ ten or more / 20 or more ] still more desirably good desirably.

[0065] Although what gave a carbon coat or silver plating to ceramic whiskers, such as what tore carbon fibers, such as a polyacrylonitrile system, a zinc oxide, and potassium titanate, is mentioned, a flexible thing is good, the thing which gave silver plating etc. to synthetic fibers, such as an acrylic, rayon, polyester, and a phenol, or a single Wall nanotube, a multi-wall nanotube, etc. are mentioned, and a wire size is [ a nanotube ] dramatically convenient for conductive fiber 0.2 micrometers or less. Although loadings are determined by desired resistance, it is 0.1 - 20wt%. It cannot be overemphasized that transparency is so high that there are so few loadings that a path is thin.

[0066] This transparent electrode 10 and the base electrode 14 which counters are vacuum evaporatio no film about ceramics, such as metals, such as gold, silver, copper, nickel, and aluminum, an alloy or tungsten carbide, silicon carbide, tin oxide, and indium oxide, or can form fullerene by photopolymerization, the electron-beam-irradiation polymerization, the plasma polymerization, electrolytic polymerization, etc. It can form also in the conductive ink which mixed conductive fillers, such as carbon black besides these particles, and graphite, in insulating resin solutions, such as an epoxy resin, urethane resin, and silicone resin.

[0067] Like a transparent electrode 10, in order to suppress the resistance change by drawing, since ductility becomes high, it is desirable to use the binder which consists of insulating resin as thermoplastics with big molecular weight, such as a polyamide with ductility, polyester, and thermoplastic elastomer. Furthermore, since a binder is extended and the chain of an electric conduction particle is not destroyed, it is more desirable to fabricate thermoplastics or thermosetting resin in the plastic flow condition. In the case of thermoplastics, what has the melting point which will be in a plastic state at about 80-150-degree C low temperature, and softening temperature is good. Or a little solvent and a plasticizer are added, and if required, it will be made to dry after size enlargement. Size enlargement postcure of the case of heat-curing resin is carried out using the thing in the condition of not hardening. For viscosity control and flow adjustment, as long as it is required, you may mix with thermoplastics.

[0068] When insulating resin is made into a conductive polymer, it is also possible the binder itself and to use it, since a flow is maintainable even if the chain of a conductive filler breaks, since it becomes conductivity, and since lowering maintenance of the resistance can be carried out by the bypass effectiveness when the existing carbon nanotube of conductive fiber or flexibility is mixed, it is still more desirable.

[0069] Although it may go across two counterelectrodes of a transparent electrode 10 and a base electrode 14 the whole surface from a viewpoint of resistance and they may be prepared, it is necessary to insulate them by the emitter layer 13, the transparence coloring layer 15, the opaque coloring layer 11, or other insulating layers. At this time, it is desirable from adhesion and a ductile point to use the same construction material as the base resin of a Plastic solid. When forming a display 2 selectively, and it can form with the usual lithography method or a usual additive process and the formative layer in conductive ink is prepared in a non-conductive polymer part apart from this, there is no need of insulating both, and it is simple, and desirable. When choosing two or more displays 2 and emitting light, a circuit pattern becomes complicated, and when it crosses, it is also possible to utilize the wiring rule used at the time of formation of the general circuit board, such as to prepare jumpering etc. and to cope with it, etc.

[0070] The feed to the member 1 for a push button switch prepares the electrode terminal of a base electrode 14, and the electrode terminal of a transparent electrode 10 in parts other than keytop section 3. Although the approach of contacting it and the electrode

terminal which is in the location which counters to the circuit board 5 to lay directly, and pressing with an elastic body if required, and the method of processing a part for an electrode terminal area simultaneously at the time of the size enlargement of the keytop section 3, and preparing a projection or the approach through an electric conduction elastic body is simple. The approach of joining with the approach using an edge connector, the anisotropic conductive adhesives which made insulating adhesives distribute an electric conduction particle can also be chosen. make it any — it has contributed to raising the degree of freedom of the design of the keytop section 3 including a display 2 by preparing the electrode terminal of a base electrode 14, and the electrode terminal of said transparent electrode 10 in parts other than keytop section 3 of the member 1 for a push button switch.

[0071] Since the life of the emitter layer 13 is influenced by humidity and oxygen, a Plastic solid has gas transparency made of the organic material in many cases, and special consideration is required for it. Moisture vapor transmission is [ below three (g/m<sup>2</sup>/24H, 40 degrees C, JIS7129K) / oxygen permeability ] required for below one (cc/m<sup>2</sup>/24 H/atm, 0%RH, JIS7126K), and those engine performance requires that the life of the emitter layer 13 should be more than 500H. On the molding object which formed the design pattern which emits light as a barrier layer of moisture or oxygen, or its medium ingredient, for example, a transparence insulation film, the inorganic oxide of oxidation silicon, an aluminum oxide, a magnesium oxide, and others is used, and chemical-vapor-deposition methods, such as physical vapor growth, such as vacuum evaporation technique, the sputtering method, and the ion plating method, or plasma chemistry vapor growth, thermochemistry vapor growth, and photochemistry vapor growth, can be formed. Or the diamond-like hard carbon film can be formed with a plasma-CVD method or ionization vacuum deposition.

[0072] If required, it is also possible to carry out surface roughening by corona discharge treatment, glow discharge processing, etc. beforehand, or to use the anchor coat agent of an alcoholic system, an urethane system, and an ester system. Since the oxygen as an oxidizer becomes easy to remain into the film when forming an inorganic oxide, the approach of not making carry out complete oxidation, but bottom-acid-izing with the oxygen of \*\*\*\*\*, and making it perfect with the oxygen which diluted the back with inert gas is effective in precise film formation. Or an amino silanol is made into a catalyst, spreading desiccation is carried out, and the alcoholic solution of the monomer of a methyl silanol or a polymer can be fabricated using an anchor coat agent, if required. Or after making the sol condition which makes an acid or alkali a catalyst for the adding-water polymerization object solution of alkoxysilane, and contains a particle, riping and going via the gel state, the sol gel coating method to heat can also be used.

[0073] since an organic radical remains in part in a sol gel process — a solvent — if meltable par hydronalium polysilazane is heated in atmospheric air and it converts into oxidation silicon, since there will be no organic radical and the precise film will be formed, it is dramatically effective. Polysilazane can be made to be able to adhere in a gaseous phase or the liquid phase, and it can heat several minutes at the temperature of about 120 degrees C from a room temperature, and can process by leaving it in atmospheric air. Since the polysilazane method is good for there to be no process of vacuum actuation and to form a precise oxide layer simple, it is desirable.

[0074] Although a precise inorganic oxide layer can control gas transparency, as for the mineralized front face, it is desirable to make a front face organic further in order to tend to call moisture. When a methyl silanol is used, since a methyl group turns to a front face, it is effective. In addition, it is desirable to make it organic on an inorganic oxide front face by chlorosilicanes [ , such as a silane coupling agent, ], such as chloropropyl trimethoxysilane and mercapto propyltrimethoxysilane, or alkoxysilane. In the case of the diamond-like hard carbon film, the front face consists of carbon and hydrogen and water repellence is highly desirable.

[0075] The member 1 for a push button switch formed with the vacuum forming etc. prepares the pocket section in the air beforehand, pours in thermosetting liquefied resin etc. after fabricating here, closes a display 2, prepares it in a desired configuration with metal mold, and forms a core material 22. Under the present circumstances, it is desirable to form the moisture absorption layer 17 which prevents enclosing drying agents, such as hygroscopic mold goods and films, such as polyamide resin, or silica gel, a zeolite, and barium oxide, and a display 2 absorbing moisture. Moreover, since oxygen permeability can absorb much oxygen well, polysilane, such as a poly methylphenyl silane besides oxygen absorbents, such as iron powder, vitamin C, and a catechol, is efficient, and especially the thing to establish for these oxygen uptake layers 18 is desirable.

[0076] [Gestalt 2 of implementation of invention] drawing 2 shows the member for a push button switch concerning the gestalt 2 of implementation of this invention.

[0077] The member 1 for a push button switch concerning the gestalt 2 of operation shown in drawing 2 forms the display 2 with an alphabetic character, a sign, or a pattern in the pars intermedia of the keytop section 3, and the field emitter 4 which carries out spontaneous light to a display 2 is used for it.

[0078] The keytop section 3 with the press projected part 8 which can press the center section of the dome section 23 of the contact sheet member 24 which formed the traveling contact 7 in the inner surface of the dome section 23 in which elastic deformation is possible so that a traveling contact 7 might be allotted to this stationary contact 6 and the location which counters to compensate for arrangement of the stationary contact 6 on the circuit board 5, and this contact sheet member 24 in the member 1 for a push button switch concerning the gestalt 2 of operation is formed in one.

[0079] Then, 1st resin Plastic solid 19 fabricated by the desired keytop configuration in the front face of the transparence insulation film 9 is formed in one, and the transparent electrode 10 is formed in the rear face of the transparence insulation film 9.

[0080] The transparence coloring layer 15 which formed the encaustic section of a display 2 in the part which hits a transparent electrode 10 in a rear face at the top panel section of the keytop section 3 in transparent coloring ink is formed. Although a display 2 is formed in a part of top panel section of the keytop section 3, the emitter layer 13 which consists of luminescent material is formed in the rear face of the transparence coloring layer 15, and the rear face of the transparent electrode 10 around the transparence coloring layer 15. Moreover, the \*\*SU electrode 14 by the silver paste is formed in the rear face of the emitter layer 13. 2nd resin Plastic solid 20 which is the core material which formed the press projected part 8 in the part which hits the rear-face center section of the keytop section 3 through the moisture absorption layer 17 is formed in the rear face of a base electrode 14 at one.

[0081] In addition, about the ingredient of each part material in the gestalt 2 of operation, since it is the same as that of the gestalt 1 of operation, refer to explanation of the gestalt 1 of operation.

[0082] Next, the manufacture approach of the member for a push button switch concerning the gestalt 2 of operation is explained.

[0083] First, the band-like transparent electrode 10 almost equal to the width of face of the top panel of a keytop 3 is formed in the part in which the keytop 3 of the rear face of the transparence insulation film 9 is located, and the encaustic section of a display 2 is formed in transparent coloring ink on this transparent electrode 10. Next, luminescent material is applied on the transparent electrode 10 by the side of the rear face of a keytop 3, and a display 2, and the emitter layer 13 is formed. Next, except for the part which hits in



the center of the rear-face section of the keytop 3 of the emitter layer 13, the insulating ink which has protection-from-light nature and insulation is applied on the periphery section of the emitter layer 13, and a transparent electrode 10, and the opaque coloring layer 11 is formed. On the illuminant layer 13, a base electrode 14 is printed as a counterelectrode, and it stops in the printing area of the opaque coloring layer 11.

[0084] Next, size enlargement processing which set this printed sheet by the configuration of desired 2nd resin Plastic solid 20 by the compressed air and the vacuum forming, press forming, etc. is performed, and the size enlargement sheet which has the crevice in which 2nd resin Plastic solid 20 used as the core material of the keytop section 3 is formed is created.

[0085] Next, after forming the moisture absorption layer 17 which touches a base electrode 14 in the crevice of the size enlargement sheet fabricated by size enlargement processing, the configuration of 2nd resin Plastic solid 20 of pouring in the thermosetting resin which serves as a core material from on the, and having the press projected part 8 in the center section is molded and stiffened within metal mold.

[0086] Then, a traveling contact 7 is formed at the head of the press projected part 8 of 2nd resin Plastic solid 20 which is a core material by applying conductive ink, and the member 1 for a push button switch of the condition except 1st resin Plastic solid 19 is completed.

[0087] Next, to the front-face side of the location where the transparence insulation film 9 in which 2nd resin Plastic solid 20 which is a core material was formed corresponds, adhesion immobilization of 1st resin Plastic solid 19 which is the core material beforehand formed in the desired keytop configuration is carried out, and the member 1 for a push button switch is completed.

[0088] since it be maintain at the environment condition by which the emitter layer 13 be isolated from the external ambient atmosphere since the emitter layer 13 be arranged between 1st resin Plastic solid 19 and 2nd resin Plastic solid 20 and be prepared in the location of the pars intermedia of the keytop section 3, if it be in the gestalt 2 of operation, even if there be no effect receptacle \*\*\*\*\* of oxygen or humidity and it use it for a long period of time, the luminescence engine performance do not fall.

[0089] [Gestalt 3 of implementation of invention] drawing 3 shows the member for a push button switch concerning the gestalt 3 of implementation of this invention.

[0090] The member 1 for a push button switch concerning the gestalt 3 of operation shown in drawing 3 forms the display 2 with an alphabetic character, a sign, or a pattern in the pars intermedia of the keytop section 3, and the field emitter 4 which carries out spontaneous light to a display 2 is used for it.

[0091] In the member 1 for a push button switch concerning the gestalt 3 of operation, the transparence insulation film 9 is in a flat condition, 1st resin Plastic solid 19 fabricated by the configuration of a desired keytop is formed in the front face at one, and the transparent electrode 10 is formed in the rear face of the transparence insulation film 9. The transparent oxygen uptake layer 18 is formed between the transparence insulation film 9 and 1st resin Plastic solid 19.

[0092] The transparence coloring layer 15 which formed the encaustic section of a display 2 in the part which hits a transparent electrode 10 in a rear face at the top panel section of the keytop section 3 in transparent coloring ink is formed. Although a display 2 is formed in a part of top panel section of the keytop section 3, the emitter layer 13 which consists of luminescent material is formed in the rear face of the transparence coloring layer 15, and the rear face of the transparent electrode 10 around the transparence coloring layer 15. And the opaque coloring layer 11 which has protection-from-light nature and insulation is formed in the lateral portion of the emitter layer 13, and the rear face of a transparent electrode 10. Moreover, as the rear face of the emitter layer 13 and the end face of the opaque coloring layer 11 are covered, the \*\*SU electrode 14 by the silver paste is formed. 2nd resin Plastic solid 20 which is the core material which formed the press projected part 8 in the part which hits the rear-face center section of the keytop section 3 is formed in the rear face of a base electrode 14 at one. The moisture absorption layer 17 is formed between the base electrode 14 and 2nd resin Plastic solid 20.

[0093] In addition, about other members without the ingredient of each part material and explanation in the gestalt 3 of operation, since it is the same as that of the gestalt 1 of operation, or 2, the same sign is given to the same configuration and those explanation is omitted.

[0094] Next, the manufacture approach of the member for a push button switch concerning the gestalt 3 of operation is explained.

[0095] First, the band-like transparent electrode 10 almost equal to the width of face of the top panel of 1st resin Plastic solid 19 is formed in the part in which 2nd resin Plastic solid 20 which is the core material of the rear face of the transparence insulation film 9 is located, and the encaustic section of a display 2 is formed in transparent coloring ink on this transparent electrode 10. Next, luminescent material is applied on the transparent electrode 10 by the side of the rear face of a keytop 3, and a display 2, and the emitter layer 13 is formed. Next, the insulating ink which has protection-from-light nature and insulation is applied on the periphery section of the emitter layer 13, and a transparent electrode 10, and the opaque coloring layer 11 is formed. In the rear face of the illuminant layer 13, a base electrode 14 is printed as a counterelectrode, and it stops in the printing area of the opaque coloring layer 11. 2nd resin Plastic solid 20 which is the core material which formed the press projected part 8 in the center section through the moisture absorption layer 17 is formed in the rear face of a base electrode 14 at one.

[0096] Next, to the front-face side of the location where the transparence insulation film 9 in which 2nd resin Plastic solid 20 which is a core material was formed corresponds, it forms in the configuration of a desired keytop beforehand, adhesion immobilization of 1st resin Plastic solid 19 which is the core material which formed the oxygen uptake layer 18 in the part which touches the transparence insulation film 9 is carried out, and the member 1 for a push button switch is completed.

[0097] since it be maintain at the environment condition by which the emitter layer 13 be isolated from the external ambient atmosphere since the emitter layer 13 be arranged between 1st resin Plastic solid 19 and 2nd resin Plastic solid 20 and be prepared in the location of the pars intermedia of the keytop section 3, if it be in the gestalt 3 of operation, even if there be no effect receptacle \*\*\*\*\* of oxygen or humidity and it use it for a long period of time, the luminescence engine performance do not fall. Moreover, since the transparence insulation film 9, a transparent electrode 10, the opaque coloring layer 11, and a base electrode 14 continue being in a flat condition, and size enlargement processing of the keytop section 3 is unnecessary, conductive degradation of a transparent electrode 10 and a base electrode 14 does not arise.

[0098] By the way, idea \*\* also showed [ the design of the various displays 2 ] the typical thing to the gestalt 1 of operation thru/or the gestalt 3 of operation at drawing 4 thru/or drawing 13.

[0099] The 1st mode of the display 2 shown in drawing 4 has the inorganic oxide layer 21, the transparence insulation film 9, a transparent electrode 10, the opaque coloring layer 11 that has the cutting die section 12, the transparence coloring layer 15 which

buried the cutting die section 12, the illuminant layer 13, and the base electrode 14 in an order from the top. Here, the transparency coloring layer 15 forms the encaustic section, and the opaque coloring layer 11 forms the ground section.

[0100] The 2nd mode of the display 2 shown in drawing 5 has the inorganic oxide layer 21, the transparency insulation film 9, a transparent electrode 10, the opaque coloring layer 11 that forms the encaustic section, the transparency coloring layer 15 which constitutes the ground section, the illuminant layer 13, and the base electrode 14 in an order from the top.

[0101] The 3rd mode of the display 2 shown in drawing 6 has the opaque coloring layer 11 which constitutes the ground section which has the inorganic oxide layer 21, the transparency insulation film 9, a transparent electrode 10, and the cutting die section 12, the illuminant layer 13 which buries the cutting die section 12 and forms the encaustic section, and the base electrode 14 in an order from the top.

[0102] The 4th mode of the display 2 shown in drawing 7 has the inorganic oxide layer 21, the transparency insulation film 9, the transparent electrode 10, the transparency coloring layer 15 that forms the encaustic section, 2nd transparency coloring layer 15a which forms the ground section and the illuminant layer 13, and the base electrode 14 in an order from the top.

[0103] The 5th mode of the display 2 shown in drawing 8 has the illuminant layer 13 and base electrode 14 which bury the cutting die section 12 through coloring transparent electrode 10a which enters into the opaque coloring layer 11 which constitutes the ground section which has the inorganic oxide layer 21, the transparency insulation film 9, and the cutting die section 12, and the cutting die section 12, and forms the encaustic section, and coloring transparent electrode 10a in an order from a top.

[0104] The 6th mode of the display 2 shown in drawing 9 has the inorganic oxide layer 21, the transparency insulation film 9, the transparency coloring layer 15 that forms the encaustic section, the opaque coloring layer 11 which forms the ground section, a transparent electrode 10 and the illuminant layer 13, and the base electrode 14 in an order from the top.

[0105] The 7th mode of the display 2 shown in drawing 10 has coloring transparent electrode 10a which constitutes the bonnet ground section for the periphery of the inorganic oxide layer 21, the transparency insulation film 9, the opaque coloring layer 11 that constitutes the encaustic section, and the opaque coloring layer 11 in an order from a top, the illuminant layer 13, and the base electrode 14.

[0106] The 8th mode of the display 2 shown in drawing 11 has the inorganic oxide layer 21, the transparency insulation film 9, the opaque coloring layer 11 that constitutes the encaustic section, the transparency coloring layer 15 which constitutes the ground section, a transparent electrode 10 and the illuminant layer 13, and the base electrode 14 in an order from the top.

[0107] The 9th mode of the display 2 shown in drawing 12 has the inorganic oxide layer 21 which covers the keytop section 3 in an order from a top, 1st resin Plastic solid 19 which is a core material, the overcoat layer 16 (transparency insulating layer), the opaque coloring layer 11 which has the mold omission section 12 and constitutes the ground section, the transparent electrode 10 which constitutes the encaustic section, the illuminant layer 13, the base electrode 14, and the opaque insulation basic field 22.

[0108] The 10th mode of the display 2 shown in drawing 13 has the inorganic oxide layer 21 which covers the keytop section 3 in an order from a top, 1st resin Plastic solid 19 which is a core material, the overcoat layer 16 (transparency insulating layer), the opaque coloring layer 11 which has the mold omission section 12 and constitutes the ground section, the transparency coloring layer 15 which constitutes the encaustic section, the transparency insulation film 9, the transparent electrode 10, the illuminant layer 13, and the base electrode 14.

[0109] Among these, as for what the pattern [ that what was shown in drawing 4 , drawing 6 , drawing 7 , drawing 8 , drawing 9 , drawing 12 , and drawing 13 consists of an alphabetic character, a sign, or a pattern ] section emits light, and was shown in drawing 5 , drawing 10 , and drawing 11 , the ground sections other than an alphabetic character, a sign, or a pattern emit light. Moreover, since what was shown in drawing 8 and drawing 10 does not need to color a transparent electrode 10, does not have to set to transparency coloring electrode 10a and does not need to use the transparency coloring layer 15 in this case, a production process becomes easy and it can reduce a manufacturing cost.

[0110] In addition, the transparency coloring layer 15 and the opaque coloring layer 11 have that good which uses elastic resin and an elastic elastomer as a binder, is what mixed the color and the pigment, sticks to the transparency insulation film 9, and is similarly ductile, and it is desirable to use resin like the transparency insulation film 9.

[0111]

[Example] The [example 1] example 1 is equivalent to the gestalt 1 of implementation of this invention.

[0112] First, one side of 100-micrometer polymethylmethacrylate (AKURIPUREN, product made from Mitsubishi Rayon) was made to distribute 3% of multi-wall nanotube (0.01 micrometers of wire sizes, 5micro of average line length, high peri-on company make) using a homogenizer to the solid content in the Pori (3, 4-ethylene dioxythiophene) (DENATORON 4001, Nagase& Co., Ltd. make) solution which doped sulfonated polystyrene, and transparent processing liquid was obtained.

[0113] Processing liquid was completely applied to one side of a film by the gravure coating machine, and the transparent electrode of 1-micrometer thickness was formed. In 70% (JIS-K7105) of total light transmission of this thing, they were surface-electrical-resistance 500ohm/\*\* (JIS-K6911). The ground section of a display 2 was removed with insulation in the black coloring ink which has electric shielding nature in the opaque coloring layer 11, the display 2 and the terminal area of a base electrode 14 were removed by screen-stencil, and it applied to the whole surface. Pori (2-methoxy-5-ethylhexyloxy) -1, The LEC ink which consists of 4-phenylenevinylene, polyethylene oxide, a lithium triphloromethanesulfonate salt, a cyclohexanone, and ethyl alcohol by printing like the opening part minimum of the ground section the 18-micrometer emitter layer 13 Subsequently, the terminal electrode connected with the base electrode 14 which turns into a counterelectrode on the illuminant layer 13, and it was prepared in the opaque coloring layer 11 with a silver paste (DODENTO NH-030A, a thermoplastic polyamide binder, product made from Japan Pewter). After this presswork termination, the vacuum dryer could be used, it was made to dry and the printing film was obtained.

[0114] Using the metal mold which has 12 mold cavities which have the diameter of 12mm, a depth of 78mm, and a base R50mm concave bend side, and the male which consists of an elastic body of 90 degrees of hardness (Shore A) which carried out templating by this, the metal piece with a diameter of 8mm was put on the display for heat insulation, it heated at 110 degrees C with infrared radiation, the metal piece was removed, and the printing film was promptly pressed between the colds.

[0115] After removing a male, initial-complement casting of the poly methylphenyl silane and liquefied epoxy resin which mixed barium-oxide powder as a core material 22 was carried out, and the press projected part 8 was fabricated to the core material 22 with the 2nd male which has the cross-section configuration shown in drawing 1 .

[0116] Next, the mask of the electrode terminal was carried out, aluminum was processed by the ion plating method in the oxygen

ambient atmosphere, the aluminum oxide was formed in the Plastic solid front face, adhesion formation of the trimethoxysilane was carried out by the gaseous-phase method, and the member 1 for a push button switch was obtained.

[0117] When the electrode terminal of the member 1 for a push button switch and the electrode terminal on the circuit board 5 were set and laid and direct-current 6V were impressed to the emitter layer 13, the display 2 presented luminescence altogether, brightness was 62 nits, and the half-life was 1225H.

[0118] The [example 2] example 2 is equivalent to the gestalt 1 of implementation of this invention.

[0119] First, 100-micrometer polymethylmethacrylate (AKURIPUREN) It is 1/6-mol sulfonation DIN DORIMA (to one mol of the DIN DORIMA trade name (PA) DAB 8 used as starting material, the diamino butane and cyanoethylene of a DSM company) of the structural unit to the poly aniline in one side made from Mitsubishi Rayon. In the DMF solution which mixed the thing to which eight mols of benzenesulfonic acid were made to react It is 3% of multi-wall nanotube (0.01 micrometers of wire sizes) to the solid content. 5micro of average line length, high peri-on company make, and azo dye (Permanent Red 4R, product made from San-yo Coloring matter) — solid content — receiving — 0.1wt(s)% — added, it was made to distribute using a homogenizer and the processing liquid of transparent red was obtained.

[0120] Processing liquid was completely applied to one side of a film by the gravure coating machine, and the red transparent electrode 10 of 1-micrometer thickness was formed. Furthermore, the conductive polymer solution which is not colored was applied to the perimeter of a display 2 by 1-micrometer screen-stencil. The total light transmission of this thing was 72% (JIS-K7105), and surface electrical resistance was 600ohm/\*\* (JIS-K6911). The ground section of a display 2 was removed in the black coloring ink which has electric shielding nature and insulation in the opaque coloring layer 11, the display 2 and the electrode terminal area of a base electrode 14 were removed by screen-stencil, and it applied to the whole surface. The 20-micrometer emitter layer 13 was formed for the LEC ink which consists of Pori (2-methoxy-5-ethylhexyloxy) -1, 4-phenylenevinylene and Pori (9 and 9-G n-hexyl FUORENIRU -2, 7'-diyl), polyethylene oxide, a lithium triphloromethanesulfonate salt, a cyclohexanone, and ethyl alcohol by printing like the opening part minimum of the ground section.

[0121] next, 0.15 mol % of vinyl groups — the included poly dimethylsiloxane (KE-78VBS, Shin-Etsu Chemical Co., Ltd. make) — silver powder (made in [ Fukuda Metal Foil & Powder ] a sill coat) — solid content — receiving — 75wt(s)% — the electrode terminal connected with a counterelectrode with a thickness of 50 micrometers and it on the emitter layer 13 was prepared in the opaque coloring layer 11 with the conductive ink which consists of an included kerosine solution. After this presswork termination, the 60-degree C vacuum dryer could be used, it was made to dry and the printing film was obtained.

[0122] When the same metal mold as an example 1 performs compression molding and size enlargement of the keytop section 3 was carried out, with the drawing of the transparence insulation film 9, the conductive ink which consists of this unvulcanized silicone rubber also flowed, and carried out size enlargement.

[0123] About 0.3 cc casting was carried out, at 120 degrees C, it is made to react with silicone rubber, and a 60-degree C vacuum dryer may be used, and the vinyl ester resin (made in [ Dow Chemical Co. ] Diller Ken 411) which mixed permutite powder, iron powder, and benzoyl peroxide as a core material 22 was dried. Furthermore, initial-complement casting of the vinyl ester resin containing benzoyl peroxide was carried out, and the press projected part 8 was fabricated to the core material 22 with the 2nd male which has the cross-section configuration shown in drawing 1.

[0124] an electrode terminal — a mask — carrying out — a polysilazane steam — for [ 25 degrees-C ] 5 minutes — hitting — a gaseous-phase method — adhesion — it saved in the layer of 25-degree-C50%RH, and was made to convert into precise silicon oxide one whole day and night Furthermore, this Plastic solid was soaked in the alcoholic solution (solid content 1wt%) of mercapto propyltrimethoxysilane, and was dried promptly, and the member 1 for a push button switch was obtained.

[0125] When the electrode terminal of the member 1 for a push button switch and the electrode terminal on the circuit board 5 were set and laid and direct-current 6V were impressed to the emitter layer 13, the display 2 presented luminescence altogether and the half-life of brightness was 1360H in 60 nits.

[0126] The [example 3] example 3 is equivalent to the gestalt 2 of implementation of this invention.

[0127] first, one side of 250-micrometer polyethylene terephthalate (lumiler, Toray Industries, Inc. make) — silicon oxide was formed in one side and the transparent electrode 10 and the inorganic oxide layer 21 were formed in the whole surface for the indium stannic acid ghost by the ion plating method, respectively. The total light transmission of this thing was 80% (JIS-K7105), and surface electrical resistance was 100ohm/\*\* (JIS-K6911).

[0128] The kino lysine derivative (NKX-1768, made in Sensitizing dye Lab) was mixed as color conversion coloring matter to thermoplastic polyester (SUTAFIKKUSU PLC, product made from Fuji Photo Film Industry), and the ink for transparence coloring layers was adjusted. On the transparent electrode 10, the transparence coloring layer 15 was printed by screen-stencil.

[0129] Subsequently, Pori [9 -(3, 6, 9-trioxa DESHIRU)- The 1.5-micrometer emitter layer 13 was formed by ink jet printing so that the transparence coloring layer 15 might be covered in the LEC ink which consists of a carbazole -3, and 6-diyl], oxyethylene cyclo tris phosphazene, toluenesulfonic acid sodium salt and a pyridine.

[0130] Next, in the same black ink as an example 1, formed the insulating layer in the part except the center section and electrode terminal of the emitter layer 13 by screen-stencil, and a vacuum dryer may be used, it was made to dry, and the printing film was obtained. The mask of the part for an electrode terminal area was carried out, aluminum was vapor-deposited, and the conductive layer which consists of carbon ink was further formed on it.

[0131] With the male which has the same cross-section configuration as what is shown in drawing 2, the press projected part 8 was fabricated to 2nd resin Plastic solid 20 which is a core material, the keytop section 3 which consists of acrylic resin further was stuck with 2 acidity-or-alkalinity acrylic adhesives, and the member 1 for a push button switch was obtained.

[0132] When the electrode terminal of the member 1 for a push button switch and the electrode terminal on the circuit board 5 were set and laid and direct-current 5V were impressed to the emitter layer 13, the display 2 presented luminescence altogether, brightness was 75 nits, and the half-life was 1300H.

[0133] The [example 4] example 4 is equivalent to the gestalt 3 of implementation of this invention.

[0134] First, the 15-micrometer ethylene vinyl alcohol copolymer film was laminated as a transparence insulation film 9 to both sides of the 100-micrometer polypropylene film which performed double-sided plasma treatment. The ground section of a display 2 was removed in green opaque coloring ink, the display 2 was removed by screen-stencil, and it applied to the whole surface. The electrode terminal connected with a display 2 and it by ink jet printing in the Pori (3, 4-ethylene dioxythiophene) solution containing the dopant to

which the 1/6-mol sulfonation fullerene (the mixed fullerene of C60 and C70, product made from MER) and the oleum of a structural unit of Pori (3, 4-ethylene dioxythiophene) were moreover made to react was formed. Furthermore, the 5-micrometer base electrode 14 was printed so that this formed poly thiophene layer might be covered for the silver paste used in the example 1 from the perimeter of a display 2 to an electrode terminal area. The total light transmission of a transparent electrode 10 is 65% (JIS-K7105), and surface electrical resistance formed the emitter layer 13 with a thickness of 2.0 micrometers so that a transparent electrode 10 might be similarly covered for the ink for LEC which consists of Pori (the p-phenylene -2, 6-benzimidazole) and polyethylene oxide which were 500ohm/\*\* (JIS-K6911), and toluenesulfonic acid lithium salt by ink jet printing. Subsequently, the electrode terminal connected with the base electrode 14 of the illuminant layer 13 and it was detached and formed from the formative layer of the display 2 of the keytop section 3 in the conductive ink which mixed silver powder with thermoplastic polyester (made in [ Toyobo Co., Ltd. ] Byron GV100) with a melting point of 86 degrees C. After this presswork termination, the vacuum dryer could be used, it was made to dry and the printing film was obtained.

[0135] Using the female mold which has 15 mold cavities with flat 3mmx5mm and base with a depth of 1mm which it has, and the male with which 2.8mmx4.8mm and a top panel with a height of 0.9mm have a flat configuration, the 2.6mmx4.6mm metal piece was put on the display 2 for heat insulation, it heated at 120 degrees C with infrared radiation, the metal piece was removed, and compression molding was promptly performed for the printing film between the molds. When size enlargement of the keytop section 3 was carried out, with the drawing of the transparency insulation film 9, the conductive ink which consists of thermoplastic polyester also flowed, and size enlargement was carried out.

[0136] After removing a male, initial-complement casting of the liquefied epoxy resin which contains 50wt(s)% iron powder as a deoxidizer is carried out. <A To HREF="/Tokujitu/tjitemdrw.ipdl?N0000=239&N0500=1E\_N/;>; <98;96///&N0001=146&N0552=9&N0553=000005" TARGET="tjitemdrw"> drawing 3 With the 2nd male which has the same cross-section configuration as what is shown, the press projected part 8 was fabricated to 2nd resin Plastic solid 20 which is a core material. Furthermore, the keytop section 3 which consists of acrylic resin was stuck with 2 acidity-or-alkalinity acrylic adhesives. Dipped into the phenyl silanol solution which carries out the mask of the electrode terminal of the acquired Plastic solid, and makes an amino silanol a catalyst, it was made to dry and react at 40 degrees C promptly, the silica layer of 2-micrometer thickness was formed in the Plastic solid front face, and the uniform member 1 for a push button switch was obtained.

[0137] When the electrode terminal of the member 1 for a push button switch and the electrode terminal on the circuit board 5 were set and laid and direct-current 4V were impressed to the emitter layer 13, the display 2 presented luminescence altogether and the half-life of brightness was 2300H in 65 nits.

[0138]

[Effect of the Invention] The keytop section for pressing the traveling contact which counters the stationary contact on the circuit board and is arranged in the direction contacted to said stationary contact according to invention indicated by claim 1, as explained above, It has a covering base material for allotting this keytop section to a position and attaching on said circuit board. In said keytop section Since it is the member for a push button switch which has the field illuminant of one in the display which displays a switch function, and this display and said field illuminant is an electrochemical luminescence object The display itself can carry out electrochemical luminescence by carrying out the seal of approval of the direct current, visibility is good also in design, small and light structure can be realized from not needing excessive components, such as an inverter, and a member with a low power, and the member for a push button switch which brings about the profitability which was moreover excellent can be offered.

[0139] According to invention according to claim 2, said keytop section It has the transparency insulation film which covers a core material and this core material. Said field emitter Since it has an illuminant layer between a base electrode and the transparent electrode which counters this base electrode and the electrode terminal of said base electrode and the electrode terminal of said transparent electrode have been extended and arranged to parts other than said keytop section Since the degree of freedom of the design of the keytop section including a display increases in addition to the effectiveness of claim 1, it can respond to the needs of the various designs to the member for a push button switch.

[0140] Since it is conductive ink in which a base electrode consists of a conductive particle and insulating resin according to invention according to claim 3 and an electric conduction property is maintainable with the ductility even if the hauling force produced at the time of the size enlargement of the keytop section acts on a base electrode in addition to the effectiveness of claim 2, the dependability of a switch function increases.

[0141] Since according to invention according to claim 4 a transparent electrode comes to form a transparent conductive polymer layer in a transparency insulation base, the luminous layer object is formed in contact with this transparent electrode top and an electric conduction property is maintainable with the ductility even if the hauling force produced at the time of the size enlargement of the keytop section acts on a transparent electrode in addition to the effectiveness of claim 2, the dependability of a switch function increases.

[0142] According to invention according to claim 5, since the transparent conductive polymer layer is colored, and the member which constitutes a display can be lessened in addition to the effectiveness of claim 4, a manufacturing cost can be reduced.

[0143] Since according to invention according to claim 6 the inorganic oxide layer is formed in a part of periphery front face [ at least ] of the member for a push button switch and transparency of humidity or oxygen can be controlled in addition to claim 1 thru/or any one effectiveness of 5, the quality of an emitter layer can be kept good.

[0144] Since according to invention according to claim 7 it comes to prepare an organic layer in the outside surface of said inorganic oxide layer further and the absorptivity of the mineralized front face can be controlled in addition to the effectiveness of claim 6, the quality of an emitter layer can be kept good more.

[0145] Since according to invention of the manufacture approach according to claim 8 an inorganic oxide layer comes to convert polysilazane, in addition to claim 6 or the effectiveness of 7 there are no organic radicals, such as an alkoxy group, and the precise film is formed, the quality of an emitter layer can be further kept good.

[0146] Since according to invention according to claim 9 the moisture absorption layer was prepared between the core of the rear-face section of the keytop section, and the inorganic oxide layer and transparency of humidity can be controlled effectively in addition to claim 6 thru/or any one effectiveness of 8, the quality of an emitter layer can be kept good.

[0147] Since according to invention according to claim 10 the oxygen uptake layer was prepared between the core of the rear-face section of the keytop section, and the inorganic oxide layer and transparency of oxygen can be controlled positively in addition to

effectiveness according to claim 9, the quality of an emitter layer can be kept good more.

[0148] Since according to invention according to claim 11 the base electrode was formed in the conductive ink which consists of a conductive particle and insulating resin, and carried out size enlargement in the state of plastic flow and it is almost lost that pull in this conductive ink and the force acts at the time of the size enlargement of the keytop section, the conductive ability of a base electrode does not fall.

[0149] The inside of the coloring layer which constitutes the encaustic section or the ground section of an illuminant layer, a transparent electrode, a base electrode, or a display according to invention according to claim 12, Since it comes to carry out size enlargement of the keytop section after forming at least three sorts on a plane transparence insulation film Since it is almost lost that unlike the conventional secondary fabricating operation pull to the configuration member of the member for a push button switch, and the force acts at the time of the size enlargement of the keytop section, The member for a push button switch which the conductive ability of a base electrode and a transparent electrode does not fall, and has the high illumination function of quality can be offered.

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[Translation done.]



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#### TECHNICAL FIELD

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[Field of the Invention] This invention is used for input devices, such as personal digital assistants, such as a cellular phone and PDA, telephone, a car stereo, a board computer for mount, an audio, a measuring instrument, a personal computer, and remote control for home theaters, and or it identifies each in the keytop section of this input device, it relates to the member for a push button switch and its manufacture approach of the illumination type which can begin to illuminate a display in more detail in a dark place about the member for a push button switch which has the display which displays a switch function.

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## PRIOR ART

[Description of the Prior Art] Conventionally, the so-called illumination function in which the member for a push button switch used for this kind of input device illuminates the display which showed the function of a push button switch in the activity at the time of night is needed.

[0003] For example, it is incorporated in the case of the input device made into the object, and enables it to realize the switch function of the push button switch 30 with the push button switch 30 used for input devices, such as a portable telephone, after the covering base material 32 and the circuit board 33 which formed in one two or more keytop sections 31 which constitute an actuation key have faced each other as shown in drawing 14 or drawing 15 . and in the top panel section of the becoming [ each actuation key ] keytop section 31, or the rear-face section, so that the function of the push button switch 30 may be known even in a dark place The display 34 which displayed an alphabetic character, a sign, or a pattern according to each switch function etc. is formed. The content of a display of a display 34 emerges and it can check by looking now because the reflected light which the direct solar radiation emitted from the light source of LED35 or electric bulb 36 grade established on the circuit board 33 and this direct solar radiation reflect and produce in a surrounding member penetrates in the top panel section from the rear-face section of the keytop section 31. Thereby, a cellular phone etc. can be used convenient also in the time of night.

[0004] Moreover, when more uniform brightness was required, as shown in drawing 16 or drawing 17 , the light guide section material 37 on sheet metal was inserted between LED35 and the keytop section 31, and to enlarge luminescence surface area by using the EL (electroluminescence) sheet 38 which carries out field luminescence as the light source was tried.

[0005] However, the light guide section material 37 which draws the direct solar radiation from the light source and the light source of LED35, an electric bulb 36, and EL sheet 38 grade Since it is arranged in the place distant from the keytop section 31 so that contact actuation with the contact surface 39 on the circuit board 33 and the keytop section 31 may not be checked. It becomes the physical relationship which the light sources 35, 36, and 38, the light guide section material 37, and a display 34 left. If it is when carry out, it compensates the light guide section material 37 or the EL sheet 38 is used, an increase and, the number of LED35 or electric bulbs 36 The case where sufficient quantity of light which checks the content of a display of a display 34 in a dark place could not be supplied although the difficulty of the design by components mark increasing becomes high arose, and it was lacking in the effectiveness.

[0006] If it was in the portable telephone which carries out cell actuation especially, the low power is called for, to secure sufficient quantity of light by a small number of light sources was desired, but by the conventional approach mentioned above, even if a part of light emitted from the light source could contribute on the check-by-looking disposition of a display 34 but it used big power consumption, conflict that it could not improve had produced visibility.

[0007] Furthermore, weight increase was to be caused while constraint arose to be unable to make thickness of the push button switch 30 thin, as a result make thin thickness of an input unit or the body of a device, in order to form the light sources 35, 36, and 38 and the light guide section material 37 between the keytop section 31 and the contact surface 39 prepared in the fixed substrate 33 corresponding to this.

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## EFFECT OF THE INVENTION

[Effect of the Invention] The keytop section for pressing the traveling contact which counters the stationary contact on the circuit board and is arranged in the direction contacted to said stationary contact according to invention indicated by claim 1, as explained above, It has a covering base material for allotting this keytop section to a position and attaching on said circuit board. In said keytop section Since it is the member for a push button switch which has the field illuminant of one in the display which displays a switch function, and this display and said field illuminant is an electrochemical luminescence object The display itself can carry out electrochemical luminescence by carrying out the seal of approval of the direct current, visibility is good also in design, small and light structure can be realized from not needing excessive components, such as an inverter, and a member with a low power, and the member for a push button switch which brings about the profitability which was moreover excellent can be offered.

[0139] According to invention according to claim 2, said keytop section It has the transparence insulation film which covers a core material and this core material. Said field emitter Since it has an illuminant layer between a base electrode and the transparent electrode which counters this base electrode and the electrode terminal of said base electrode and the electrode terminal of said transparent electrode have been extended and arranged to parts other than said keytop section Since the degree of freedom of the design of the keytop section including a display increases in addition to the effectiveness of claim 1, it can respond to the needs of the various designs to the member for a push button switch.

[0140] Since it is conductive ink in which a base electrode consists of a conductive particle and insulating resin according to invention according to claim 3 and an electric conduction property is maintainable with the ductility even if the hauling force produced at the time of the size enlargement of the keytop section acts on a base electrode in addition to the effectiveness of claim 2, the dependability of a switch function increases.

[0141] Since according to invention according to claim 4 a transparent electrode comes to form a transparent conductive polymer layer in a transparence insulation base, the luminous layer object is formed in contact with this transparent electrode top and an electric conduction property is maintainable with the ductility even if the hauling force produced at the time of the size enlargement of the keytop section acts on a transparent electrode in addition to the effectiveness of claim 2, the dependability of a switch function increases.

[0142] According to invention according to claim 5, since the transparent conductive polymer layer is colored, and the member which constitutes a display can be lessened in addition to the effectiveness of claim 4, a manufacturing cost can be reduced.

[0143] Since according to invention according to claim 6 the inorganic oxide layer is formed in a part of periphery front face [ at least ] of the member for a push button switch and transparency of humidity or oxygen can be controlled in addition to claim 1 thru/or any one effectiveness of 5, the quality of an emitter layer can be kept good.

[0144] Since according to invention according to claim 7 it comes to prepare an organic layer in the outside surface of said inorganic oxide layer further and the absorptivity of the mineralized front face can be controlled in addition to the effectiveness of claim 6, the quality of an emitter layer can be kept good more.

[0145] Since according to invention of the manufacture approach according to claim 8 an inorganic oxide layer comes to convert polysilazane, in addition to claim 6 or the effectiveness of 7 there are no organic radicals, such as an alkoxy group, and the precise film is formed, the quality of an emitter layer can be further kept good.

[0146] Since according to invention according to claim 9 the moisture absorption layer was prepared between the core of the rear-face section of the keytop section, and the inorganic oxide layer and transparency of humidity can be controlled effectively in addition to claim 6 thru/or any one effectiveness of 8, the quality of an emitter layer can be kept good.

[0147] Since according to invention according to claim 10 the oxygen uptake layer was prepared between the core of the rear-face section of the keytop section, and the inorganic oxide layer and transparency of oxygen can be controlled positively in addition to effectiveness according to claim 9, the quality of an emitter layer can be kept good more.

[0148] Since according to invention according to claim 11 the base electrode was formed in the conductive ink which consists of a conductive particle and insulating resin, and carried out size enlargement in the state of plastic flow and it is almost lost that pull in this conductive ink and the force acts at the time of the size enlargement of the keytop section, the conductive ability of a base electrode does not fall.

[0149] The inside of the coloring layer which constitutes the encaustic section or the ground section of an illuminant layer, a transparent electrode, a base electrode, or a display according to invention according to claim 12, Since it comes to carry out size enlargement of the keytop section after forming at least three sorts on a plane transparence insulation film Since it is almost lost that unlike the conventional secondary fabricating operation pull to the configuration member of the member for a push button switch, and the force acts at the time of the size enlargement of the keytop section, The member for a push button switch which the conductive ability of a base electrode and a transparent electrode does not fall, and has the high illumination function of quality can be offered.

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## TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Then, in order to cancel the above nonconformities, that to which the device which prevents diffusion of light and loss of the quantity of light by the obstruction by preparing the field emitter which carries out spontaneous light to the top panel section of the keytop section like invention indicated by JP,11-232954,A or JP,2000-285760,A, and attaching the light source near the display is performed is known.

[0009] And into a high dielectric organic substance, since these field emitters are organic distributed process input output equipment EL (inorganic [ EL ]) which distributed inorganic emitter powder, they are impressing the alternating current for actuation.

[0010] Moreover, although a transparent electrode, a display, or the 2nd electrode is beforehand prepared on a transparence insulation base and it fabricates by spinning etc. since a display is located in the top panel section of the keytop section, a transparence insulation base follows on being extended, an electrode material etc. is extended, and the device which suppresses lifting of the resistance of a transparent electrode is made. However, since the device which owns only DC power supplies, such as a personal digital assistant, since organic distributed process input output equipment EL (inorganic [ EL ]) is being used for the conventional member for a push button switch to which these displays emit light had to carry out conversion into ac of this, it had to carry out pressure up further and it needed an excessive component and its tooth space, it has been used only for the limited product. Furthermore, since it is driving by the alternating current, there are an oscillation and generating of a noise and nonconformities, such as displeasure and communication failure, have arisen in the activity in the cellular phone.

[0011] Moreover, although the low power was called for more especially in the personal digital assistant which carries out cell actuation also in energy, it was low, and electric - light conversion efficiency was also bringing the life of a cell forward, and was user-unfriendly.

[0012] Furthermore, since the transparent electrode which a transparence electric conduction ceramic layer is prepared [ transparent electrode ] by sputtering, or makes an organic binder come to distribute expensive powder is used, resistance becomes very large at the time of shaping, and since an electrode material has the disadvantageous nonconformity that a display does not light up, it has not reached the level of practical use industrially.

[0013] Then, it thinks in order to solve the problem of the member for a push button switch which illuminates the display of the above conventional keytop sections, this invention is use light energy for illumination of a display without futility, though power consumption is press down, it can realize illumination of a display without brightness unevenness, and it makes it a technical problem to offer the thin and light member for a push button switch and its manufacture approach of thickness by use the field illuminant drive by direct current.

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## MEANS

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, invention according to claim 1 The keytop section for pressing the traveling contact which counters the stationary contact on the circuit board and is arranged in the direction contacted to said stationary contact, It has a covering base material for allotting this keytop section to a position and attaching on said circuit board. In said keytop section It is the member for a push button switch which has the field illuminant of one in the display which displays a switch function, and this display, and is characterized by said field illuminant being an electrochemical luminescence object.

[0015] invention according to claim 2 — the configuration of claim 1 — in addition, said keytop section has the transparence insulation film which covers a core material and this core material, said field illuminant has an illuminant layer between a base electrode and the transparent electrode which counters this base electrode, and it is characterized by having extended and arranged the electrode terminal of said base electrode, and the electrode terminal of said transparent electrode to parts other than said keytop section.

[0016] In addition to the configuration of claim 2, invention according to claim 3 is characterized by being conductive ink in which said base electrode consists of a conductive particle and insulating resin.

[0017] As for said transparent electrode, in addition to the configuration of claim 2, invention according to claim 4 is characterized by coming to form a transparent conductive polymer layer in a transparence insulation base, and forming said luminous layer object in contact with this transparent electrode.

[0018] In addition to the configuration of claim 4, invention according to claim 5 is characterized by coloring said transparent conductive polymer layer.

[0019] invention according to claim 6 — claim 1 thru/or 5 — any one configuration — in addition, it is characterized by for the outside surface of said member for a push button switch boiling a part at least, and forming the inorganic oxide layer.

[0020] In addition to the configuration of claim 6, invention according to claim 7 is characterized by coming to prepare an organic layer in the outside surface of said inorganic oxide layer.

[0021] invention according to claim 8 — claim 6 or the configuration of 7 — in addition, said inorganic oxide layer is characterized by being the thing which comes to convert polysilazane.

[0022] In addition to claim 6 thru/or any one configuration of 8, invention according to claim 9 is characterized by preparing a moisture absorption layer between said base electrodes and cores of said keytop section.

[0023] In addition to the configuration of claim 9, invention according to claim 10 is characterized by preparing an oxygen uptake layer between said base electrodes and cores of said keytop section.

[0024] Invention according to claim 11 is the manufacture approach of claim 1 thru/or the member for a push button switch any one publication of ten, is formed in the conductive ink in which said base electrode consists of a conductive particle and insulating resin, and is characterized by carrying out size enlargement of this conductive ink in the state of plastic flow.

[0025] Invention according to claim 12 is the manufacture approach of claim 1 thru/or the member for a push button switch any one publication of ten, and after it forms at least three sorts in the coloring layer which constitutes the encaustic section or the ground section of said illuminant layer, said transparent electrode, said base electrode, or said display on a plane transparence insulation film, it is characterize by come to carry out size enlargement of the keytop section and the electrode terminal area.

[0026]

[Embodiment of the Invention] Hereafter, drawing 1 thru/or drawing 13 explain the gestalt of implementation of this invention.

[0027] [Gestalt 1 of implementation of invention] drawing 1 is the important section sectional view having shown the member for a push button switch concerning the gestalt 1 of implementation of this invention.

[0028] The member 1 for a push button switch concerning the gestalt 1 of operation shown in drawing 1 forms the display 2 which displayed the switch function with an alphabetic character, a sign, or a pattern in the top panel section side of the keytop section 3, and the field emitter 4 which carries out spontaneous light to a display 2 is used for it.

[0029] The traveling contact 7 which is made to counter the stationary contact 6 on the circuit board 5, and is arranged is formed in the member 1 for a push button switch concerning the gestalt 1 of operation. A traveling contact 7 is specifically formed at the head of the press projected part 8 prepared in the center of the rear-face section of the keytop section 3, and the traveling contact 7 enables it to contact to a stationary contact 6 by pressing the keytop section 3 to a circuit board 5 side.

[0030] It is the periphery section of the keytop section 3. Moreover, between the member 1 for a push button switch, and the circuit board 5 When the covering base material (not shown) of spring materials, such as silicone rubber which formed in one two or more keytop sections 3 allotted to the position, is formed and the keytop section 3 is pressed, some covering base materials carry out elastic deformation to a circuit board 5 side. When a hand is lifted from the keytop section 3, the keytop section 3 enables it to return to the original location according to the elastic stability of a covering base material.

[0031] Two or more keytop sections 3 are arranged by the need, it has the complicated configuration of a three dimension from points, such as an ERUGONOMIKKU design, upheaved from parts other than keytop section 3, and the member 1 for a push button switch projects from opening (not shown) prepared in the case of an input unit. As for a display 2, that with which a figure, an alphabetic character, or a pattern is adopted and indicates the discernment function of the keytop section 3 or the switch symbol description of the keytop section 3 to be is used. Although these displays 2 are identified according to the color difference of for example, an alphabetic character color (encaustic



section) and background colors other than an alphabetic character (ground section), a hue with sufficient visibility will be chosen if needed.

[0032] For example, a switch function can be made easier to be able to distinguish actuation of the keytop section 3 which has two or more displays 2, such as a figure and the alphabet, in the one keytop section 3, and has many functions by changing this and making light emit with the separate luminescent color, and to operate it. Although it is illuminated for an input check in order that a display 2 may raise the visibility in a dark place or, the design, such as an alphabetic character illuminating, or a background illuminating, or illuminating both an alphabetic character and a background, is determined freely. Although the brightness of illumination changes with luminescent color, it is ten to 100 nit (nt) about.

[0033] The ingredient of the core material 22 of the keytop section 3 which determines the substantial configuration of the keytop section 3 is chosen from hard, elasticity resin, or an elastomer. Although thermoplastic or thermosetting any are sufficient and it is not limited to the shape of a film, a pellet type, and the gestalt of liquefied \*\*\*\*\*, liquefied thermosetting resin is easy to pour in and it is desirable.

[0034] The transparence insulation film 9 is covered by the periphery front face of the member 1 for a push button switch except the rear-face section of the keytop section 3, and the transparent electrode 10 used as one electrode of the field emitter 4 is formed in it in the rear face of this transparence insulation film 9 in the range which reaches the top panel section of the keytop section 3 from the side face of the keytop section 3. The opaque coloring layer 11 which has protection-from-light nature and insulation is formed in the rear face of the transparence insulation film 9 in which the rear face of a transparent electrode 10 and the transparent electrode 10 are not formed.

[0035] And the cutting die section 12 doubled with gestalten, such as an alphabetic character of a display 2, a sign, or a pattern, is formed in the opaque coloring layer 11. The emitter layer 13 of magnitude slightly smaller than the magnitude of the top panel section of the keytop section 3 including the cutting die section 12 is formed in the rear face of the opaque coloring layer 11. Therefore, the cutting die section 12 will be fill uped with the emitter layer 13, the pattern [ that it consists of an alphabetic character, a sign, or a pattern ] section will be formed, and the design of a display 2 will be completed by the ground section which consists of an opaque coloring layer 11 around this encaustic section and the cutting die section 12. And the base electrode 14 which forms another electrode is formed in the rear face of the illuminant layer 13.

[0036] Moreover, as the oxygen uptake layer 18 and the moisture absorption layer 17 lap between the rear face of a base electrode 14 and the opaque coloring layer 11, and the core material 22 of the keytop section 3, they are formed in it. The emitter layer 13 is protected from oxygen and humidity, and it enables it to maintain the quality by this at a long period of time.

[0037] That to which the structure where display 2 the very thing emits light consists of a LEC (Light Emitting Electrochemical Cell, electrochemical luminescence) object with easy compound-izing with the Plastic solid of resin by making homogeneity emit light, and carries out visible luminescence of the field of a display 2 directly, the thing which carried out ultraviolet luminescence light outside and changed this into visible luminescence are contained.

[0038] LEC is the structure where one side [ at least ] which counters made the about 0.5-50-micrometer emitter layer 13 pinch among 2 electrodes (a transparent electrode 10 and base electrode 14) of transparence. The illuminant layer 13 The poly thiophene, polyphenylene, polyphenylene vinylene, With derivatives, such as polypyrrole, polyacethylene, and the poly vinylene, a conjugation polymer, and oligomer, or laser coloring matter etc. and ethyleneoxide, FOSUFAZEN, propylene oxide, dimethylsiloxane, oxy-methylene, EPIKUROROHIDORAN, oxetane, a tetrahydrofuran 1, 3-dioxolane, Metal salts, such as a lithium triphloromethanesulfonate salt, are mixed with the electrolyte matter of polymers, such as ECHIRENIMIN, ethylene succinate, ethylene sulfonate, oxyethylene methacrylate, and oxyethylene cyclo tris phosphazene, or oligomer. In addition, the salt which consists of organic acids, such as inorganic acids, such as alkali metal, an alkaline earth metal, aluminum, silver, copper, cobalt, zinc, ammonium, tetramethylammonium, phenyl ammonium, etc. a halogen and perchloric acid, a nitric acid, a sulfuric acid, phosphoric acid, and a boric acid, a truffe ROROME tongue sulfonamide and an acetic acid, toluenesulfonic acid, a salicylic acid, and a benzoic acid, is mentioned.

[0039] In order to change into the condition that the cation of a previous salt and an anion can move the inside of an electrolyte to mixing, Although dissolution mixing is carried out with a simple substance or mixed solvents, such as toluene, pill gin, an acetonitrile, octyl cyano acetate, a cyclohexanone, alcohols, and water, in order [ whose magnitude of nothing and a cel is about 10-100nm ] to form reticulated, a conjugation polymer and an electrolyte a phase The compatibility of a solvent, an electrolyte and a solvent, a conjugation polymer, and an electrolyte and a conjugation polymer is important.

[0040] If the electrical potential difference of 3-6V of a direct current is impressed to a transparent electrode 10 and a base electrode 14, the cation of a salt and an anion will move to cathode and an anode plate, respectively, and will carry out electrochemistry doping of the nearby conjugation polymer. Consequently, P type and an N-type semiconductor will be electrochemically generated with sufficient balance, an electron or an electron hole will be efficiently supplied to a conjugation polymer, and light is emitted (for example, WO 96/00968).

[0041] Thus, LEC has that structure is simple and the description that thickness control is easy and a low power.

[0042] Although the luminescent color of emitter layer 13 the very thing can also be used for a display 2, the color of the request of those other than the luminescent color can be chosen between the emitter layer 13 and a transparent electrode 10 by coloring transparent electrode 10a which colored the transparent electrode 10 which touches the transparence coloring layer 15 prepared on the base which supports a transparent electrode 10, or the emitter layer 13. What changes the wavelength itself can be used for the transparence coloring layer 15 using color conversion coloring matter, such as coloring matter which penetrates request wavelength, such as an azo pigment used for a light filter, a nitroso pigment, a nitro pigment, and an alizarin lake, and benzopyranon, a kino lysine, ethyl pyridinium perchlorate, an ethyl bends oxazolium perchlorate derivative. a long wave with color conversion low [ the high short wavelength of energy ] — changing into merit is efficient.

[0043] Next, the manufacture approach of the member 1 for a push button switch concerning the gestalt 1 of operation is explained.

[0044] In first, the part in which the even transparence insulation film 9 is made into the bottom, and the keytop section 3 of this transparence insulation film 9 is located The band-like transparent electrode 10 almost equal to the width of face of the top panel of the keytop section 3 is formed. By performing negative printing in the opaque coloring ink which has protection-from-light nature and insulation from on this transparent electrode 10 centering on the part applicable to the top panel section of the keytop section 3 The opaque coloring layer 11 of sufficient magnitude for a wrap is formed for the periphery front face of the member 1 for a push button switch except the rear-face section of the keytop section 3. Under the present circumstances, the cutting die section 12 which

modeled the configuration of the encaustic section of the display 2 which displayed the switch function is formed in the part in which the top panel section of the keytop section 3 of the opaque coloring layer 11 is located.

[0045] Next, on the opaque coloring layer 11, luminescent material is printed in magnitude slightly smaller than the magnitude of the top panel section of the keytop section 3 including the cutting die section 12, and the emitter layer 13 is formed. Thereby, the cutting die section 12 is filled up with the emitter layer 13. Furthermore, the printed sheet before size enlargement processing (not shown) is completed by forming the base electrode 14 of the almost same magnitude as the illuminant layer 13 on the illuminant layer 13, and making it the illuminant layer 13 stop at the cutting die section 12 of the opaque coloring layer 11.

[0046] Formation of the encaustic section of a display 2, \*\*\*\*, and opaque coloring layer 11 grade should just perform the usual transparence and opaque ink using technique, such as screen-stencil, ink jet printing, hot printing printing, gravure, spray painting, DIP coating, spin coating, and vacuum evaporation. Moreover, the color of a printing base can also be used as it is.

[0047] Next, size enlargement processing which set the printed sheet before size enlargement processing mentioned above by the configuration of the desired keytop section 3 by the compressed air and the vacuum forming, press forming, etc. is performed, and the size enlargement sheet which has the crevice in which the core material 22 of the keytop section 3 is formed is created. At this time, the flection of a transparent electrode 10 needs to secure sufficient radius of circle so that the resistance of a transparent electrode 10 and a base electrode 14 may not change a lot.

[0048] Next, after forming the moisture absorption layer 17 which touches the oxygen uptake layer 18 and this oxygen uptake layer 18 in contact with a base electrode 14 in the crevice of the size enlargement sheet fabricated by size enlargement processing, the thermosetting resin which serves as a core material 22 from on that is poured in, and it is made to harden within metal mold. Then, the member 1 for a push button switch which forms a traveling contact 7 at the head of the press projected part 8 of the keytop section 3 by applying conductive ink, and starts the gestalt 1 of operation is completed.

[0049] A transparence conductive layer can be formed in what carried out injection molding of the transparence insulation Plastic solid which became a request configuration, for example, the acrylic resin, as a transparent electrode 10 for SERAMMIKU, such as tin oxide, indium oxide, and a zinc oxide, by technique, such as electron beam evaporation, ion plating, and sputtering. Or the transparent conductive ink which mixed the particle of a ceramic in the transparence insulation resin solution can be formed by the general printing methods of application, such as screen-stencil, gravure, ink jet printing, spray coating, DIP coating, and spin coating. Or the resin compound which mixed the particle of the above mentioned ceramic to transparence insulation resin may be fabricated directly. About, the surface electrical resistance is 10-3000ohm/\*\*, and light transmission is 50 - 90%.

[0050] Although it is also possible to form a transparent electrode 10 on the Plastic solid (core material) beforehand fabricated by the request configuration When control of thickness etc. is taken into consideration on industrial utilization, it is desirable to prepare a transparence conductive layer on the transparence insulation film 9 beforehand. Polyvinyl alcohol, polyethylene whose thickness is about 25-500 micrometers, Polyethylene terephthalate, polyethylenenaphthalate, the poly acrylic, A polycarbonate, polystyrene, poly FURORO ethylene propylene, Poly chloro TORIFURORO ethylene, the poly vinylidene, polyimide, polyamidoimide, Polyether sulphone, polysulfone, polyphenylene sulfide, Double \*\*\*\* which carried out the lamination of several sorts besides denaturation objects, such as a polyamide, polyarylate or a styrene system, a polyester system, a polyamide system thermoplastic elastomer, and those copolymerization objects, an alloy, of films can be used.

[0051] If extended by the processing method which the transparence insulation film 9 mentions later, since the transparent electrode 10 which is a transparence conductive layer is also set and extended, conductivity will fall, but since the transparent conductive ink which used the same resin as the transparence insulation film 9 as the binder has adhesion or the near working characteristic, it is desirable. Furthermore, since a chain tends to break easily to 50% or more of Plastic solid, the conductive polymer whose very thing itself is conductivity has a rate of a drawing dramatically convenient although the transparent conductive ink which distributed the conductive filler brings about conductivity by the chain of a conductive filler.

[0052] These conductive polymers Polyacethylene, poly para-phenylene, polypyrrole, The poly thiophene, the poly aniline, polyphenylene vinylene, poly seleno FEN, The poly azulene, the poly pyrene, the poly carbazole, the poly pyridazine, poly naphthylene, The polyethylene dioxythiophene which introduced substituents, such as the poly fluorenes, those alkylation, and alkoxy-izing, Poly thienylene vinylene, Pori (3 methylthiophene), Pori (3, 4-dimethylthiophene), Pori (3-thiophene-beta-ethane sulfo nail), the poly methyl pyrrole, Conjugated-system conductive polymers, such as Pori (it is a KISHIRU pyrrole to 3), Pori (3-methyl-4-pyrrole carboxylic-acid methyl), poly cyano phenylenevinylene, a poly dimethoxy phenylenevinylene derivative, or a polyisoprene conversion object, are mentioned.

[0053] Among these, although it has the influence of a dopant, it is extremely stable to oxygen or humidity, and it is transparent and polypyrrole and the poly thiophene with high conductivity, and the poly aniline derivative are desirable.

[0054] Since resistance sufficient in a conductive polymer simple substance cannot be obtained, it is necessary to dope. As an acceptor, halogens, such as iodine and a bromine, PF5, AsF5, the Lewis acid of BF3 grade, HF, HCl, proton acid and Para toluenesulfonic acid of H2SO4 grade, Organic acids, such as PARAMETOKISHI ethyl toluenesulfonic acid, FeCl3, the transition-metals compound of TiCl4 grade, The alkali-metal earth, such as alkali metal as an organic substance or donors, such as tetracyano dimetan, tetracyano tetraaza naphthalene, and chloranil, such as Li, Na, and K, and calcium, Sr, Ba, etc. is mentioned.

[0055] In order to raise the stability by humidity and temperature, an electrolyte anion and a cation are avoided, caution is required for a dedope and coordinate bond, copolymerization, etc. with a conductive polymer are [ it is / direction / good and ] an effective approach to immobilization. Especially the thing for which oligomer, such as DIN DORIMA which was made to carry out sequential association from a core molecule by considering as a start raw material, and was compounded [ monomer / of AB2 mold ] in the dopant, polystyrene, polymethylmethacrylate, and polyurethane, a polymer, or a fullerene molecule is introduced into a functional group, and this is supported is simple, and it is especially desirable from the adhesion to a transparence insulation Plastic solid or a film increasing. Moreover, since the dopant which became many organic functions focusing on such support also becomes carrying out the bridge of between conductive polymer molecules, stabilizing in electric conduction, and lowering resistance, it is dramatically useful. It is better to make it store into a Plastic solid, since the effect of a dedope becomes very small where a conductive polymer is closed.

[0056] Furthermore, in order to reduce conductivity, a conductive polymer is extended, it is useful to contract the intermolecular distance of a conductive polymer, and it can use the drawing at the time of size enlargement.

[0057] Although a conductive polymer has the chemical polymerization method which carries out the polymerization of the precursor monomer using an oxidizer or a catalyst, a method of heat-treating and obtaining the intermediate field which consist of a

disconjugation polymer, or the electrolytic polymerization method which oxidizes or returns and carries out the polymerization of the aromatic compound electrochemically as a monomer, it is not limited to this.

[0058] On the transparence insulation film 9, it can form by the general printing method of application in the state of a condition or the dispersed emulsion which prepared the low-molecular article of a conductive polymer by vacuum evaporatio etc., or was dissolved in water or a solvent. The thickness is about 0.1–25 micrometers about. In the case of a conductive polymer, even if there are much thickness and resistance and a non-ohmic \*\*\*\*\* case thickens them, the resistance reduction corresponding to it is not obtained in many cases, and light transmission only worsens. Therefore, it is necessary to determine required thickness beforehand.

[0059] Although it is also possible to form the display 2 to which itself emits light on an opaque electrode, to form a transparence conductive layer by the technique further mentioned above, and to form the overcoat layer 16 for protection if required, to give the coat which has sufficient engine performance, in order to protect the emitter layer 13 sensitive to humidity etc., for example, to prepare resin with low moisture vapor transmission thickly is desired.

[0060] When using a transparent electrode (transparence conductive layer) 10 for the rear face of the transparence insulation film 9 and the transparence insulation film 9 is carried out outside, a display 2 can be protected with the continuous transparence insulation film 9, it is simple, and usefulness is high. For example, when using the luminescent color as it is, it is attained by preparing in order of the transparence insulation film 9, the opaque coloring layer 11, a transparent electrode (transparence conductive layer) 10, and the emitter layer 13.

[0061] When using colors other than the luminescent color, it is attained by preparing in order of the transparence insulation film 9, the opaque coloring layer 11, coloring transparent electrode 10a, and the emitter layer 13 etc. coloring transparent electrode 10a — the binder of a conductive polymer or transparent conductive ink — organic coloring matter — small quantity — in addition, it can make.

[0062] From an ERUGONOMIKKU design, the design of the complicated three-dimensional structure is required and size enlargement of the member 1 for a push button switch is carried out by the shaping approaches, such as a vacuum forming, blow molding, and press forming. The height of the square pole with which the configuration of a Plastic solid has the cross section whose magnitude of 5–30mm and the keytop section 3 key pitch is 3–20mm about or a cylinder, and the keytop section 3 is 2–15mm. Although there are many in which the top panel section of the keytop section 3 also has curvature, applying excessive flow stress to the display which emits light should avoid.

[0063] A display 2 is near the top panel section of the keytop section 3, and since the part of members 1 for a push button switch other than keytop section 3 is laid or stuck on the fixed substrate 5, it is carrying out the flat-surface configuration.

[0064] Especially at the time of size enlargement, since the side face of the keytop section 3 is extended, the transparence insulation film 9 and a transparent electrode (transparence conductive layer) 10 must be the ingredients suitable for this, and a thing without fracture or resistance lifting is chosen. A conductive polymer is an ingredient suitable for this, can form thickly the conductive polymer around the display 2 especially with the high rate of a drawing, and can suppress resistance lifting. When the side face of the background (ground section) of a display 2 or the keytop section 3 is opaque, compensating in the conductive ink mentioned later is also possible. However, when too much drawing which exceeds 100% is performed, there is a possibility that resistance may go up about 10 times. In this case, conductivity is maintainable when a wire size mixes detailed conductive fiber 0.5 micrometers or less to a conductive polymer. As for the aspect ratio of the conductive fiber in this case, 50 or more are [ ten or more / 20 or more ] still more desirably good desirably.

[0065] Although what gave a carbon coat or silver plating to ceramic whiskers, such as what tore carbon fibers, such as a polyacrylonitrile system, a zinc oxide, and potassium titanate, is mentioned, a flexible thing is good, the thing which gave silver plating etc. to synthetic fibers, such as an acrylic, rayon, polyester, and a phenol, or a single Wall nanotube, a multi-wall nanotube, etc. are mentioned, and a wire size is [ a nanotube ] dramatically convenient for conductive fiber 0.2 micrometers or less. Although loadings are determined by desired resistance, it is 0.1 – 20wt%. It cannot be overemphasized that transparency is so high that there are so few loadings that a path is thin.

[0066] This transparent electrode 10 and the base electrode 14 which counters are vacuum evaporatio film about ceramics, such as metals, such as gold, silver, copper, nickel, and aluminum, an alloy or tungsten carbide, silicon carbide, tin oxide, and indium oxide, or can form fullerene by photopolymerization, the electron-beam-irradiation polymerization, the plasma polymerization, electrolytic polymerization, etc. It can form also in the conductive ink which mixed conductive fillers, such as carbon black besides these particles, and graphite, in insulating resin solutions, such as an epoxy resin, urethane resin, and silicone resin.

[0067] Like a transparent electrode 10, in order to suppress the resistance change by drawing, since ductility becomes high, it is desirable to use the binder which consists of insulating resin as thermoplastics with big molecular weight, such as a polyamide with ductility, polyester, and thermoplastic elastomer. Furthermore, since a binder is extended and the chain of an electric conduction particle is not destroyed, it is more desirable to fabricate thermoplastics or thermosetting resin in the plastic flow condition. In the case of thermoplastics, what has the melting point which will be in a plastic state at about 80–150-degree C low temperature, and softening temperature is good. Or a little solvent and a plasticizer are added, and if required, it will be made to dry after size enlargement. Size enlargement posture of the case of heat-curing resin is carried out using the thing in the condition of not hardening. For viscosity control and flow adjustment, as long as it is required, you may mix with thermoplastics.

[0068] When insulating resin is made into a conductive polymer, it is also possible the binder itself and to use it, since a flow is maintainable even if the chain of a conductive filler breaks, since it becomes conductivity, and since lowering maintenance of the resistance can be carried out by the bypass effectiveness when the existing carbon nanotube of conductive fiber or flexibility is mixed, it is still more desirable.

[0069] Although it may go across two counterelectrodes of a transparent electrode 10 and a base electrode 14 the whole surface from a viewpoint of resistance and they may be prepared, it is necessary to insulate them by the emitter layer 13, the transparence coloring layer 15, the opaque coloring layer 11, or other insulating layers. At this time, it is desirable from adhesion and a ductile point to use the same construction material as the base resin of a Plastic solid. When forming a display 2 selectively, and it can form with the usual lithography method or a usual additive process and the formative layer in conductive ink is prepared in a non-conductive polymer part apart from this, there is no need of insulating both, and it is simple, and desirable. When choosing two or more displays 2 and emitting light, a circuit pattern becomes complicated, and when it crosses, it is also possible to utilize the wiring rule used at the time of formation of the general circuit board, such as to prepare jumpering etc. and to cope with it, etc.

[0070] The feed to the member 1 for a push button switch prepares the electrode terminal of a base electrode 14, and the electrode

terminal of a transparent electrode 10 in parts other than keytop section 3. Although the approach of contacting it and the electrode terminal which is in the location which counters to the circuit board 5 to lay directly, and pressing with an elastic body if required, and the method of processing a part for an electrode terminal area simultaneously at the time of the size enlargement of the keytop section 3, and preparing a projection or the approach through an electric conduction elastic body is simple. The approach of joining with the approach using an edge connector, the anisotropic conductive adhesives which made insulating adhesives distribute an electric conduction particle can also be chosen. make it any — it has contributed to raising the degree of freedom of the design of the keytop section 3 including a display 2 by preparing the electrode terminal of a base electrode 14, and the electrode terminal of said transparent electrode 10 in parts other than keytop section 3 of the member 1 for a push button switch.

[0071] Since the life of the emitter layer 13 is influenced by humidity and oxygen, a Plastic solid has gas transparency made of the organic material in many cases, and special consideration is required for it. Moisture vapor transmission is [ below three (g/m<sup>2</sup>/24H, 40 degrees C, JIS7129K) / oxygen permeability ] required for below one (cc/m<sup>2</sup>/24 H/atm, 0%RH, JIS7126K), and those engine performance requires that the life of the emitter layer 13 should be more than 500H. On the molding object which formed the design pattern which emits light as a barrier layer of moisture or oxygen, or its medium ingredient, for example, a transparence insulation film, the inorganic oxide of oxidation silicon, an aluminum oxide, a magnesium oxide, and others is used, and chemical-vapor-deposition methods, such as physical vapor growth, such as vacuum evaporation technique, the sputterin method, and the ion plating method, or plasma chemistry vapor growth, thermochemistry vapor growth, and photochemistry vapor growth, can be formed. Or the diamond-like hard carbon film can be formed with a plasma-CVD method or ionization vacuum deposition.

[0072] If required, it is also possible to carry out surface roughening by corona discharge treatment, glow discharge processing, etc. beforehand, or to use the anchor coat agent of an alcoholic system, an urethane system, and an ester system. Since the oxygen as an oxidizer becomes easy to remain into the film when forming an inorganic oxide, the approach of not making carry out complete oxidation, but bottom-acid-izing with the oxygen of \*\*\*\*\*, and making it perfect with the oxygen which diluted the back with inert gas is effective in precise film formation. Or an amino silanol is made into a catalyst, spreading desiccation is carried out, and the alcoholic solution of the monomer of a methyl silanol or a polymer can be fabricated using an anchor coat agent, if required. Or after making the sol condition which makes an acid or alkali a catalyst for the adding-water polymerization object solution of alkoxysilane, and contains a particle, riping and going via the gel state, the sol gel coating method to heat can also be used.

[0073] since an organic radical remains in part in a sol gel process — a solvent — if meltable par hydronalium polysilazane is heated in atmospheric air and it converts into oxidation silicon, since there will be no organic radical and the precise film will be formed, it is dramatically effective. Polysilazane can be made to be able to adhere in a gaseous phase or the liquid phase, and it can heat several minutes at the temperature of about 120 degrees C from a room temperature, and can process by leaving it in atmospheric air. Since the polysilazane method is good for there to be no process of vacuum actuation and to form a precise oxide layer simple, it is desirable.

[0074] Although a precise inorganic oxide layer can control gas transparency, as for the mineralized front face, it is desirable to make a front face organic further in order to tend to call moisture. When a methyl silanol is used, since a methyl group turns to a front face, it is effective. In addition, it is desirable to make it organic on an inorganic oxide front face by chlorosilicanes [ , such as a silane coupling agent, ], such as chloropropyl trimethoxysilane and mercapto propyltrimethoxysilane, or alkoxysilane. In the case of the diamond-like hard carbon film, the front face consists of carbon and hydrogen and water repellence is highly desirable.

[0075] The member 1 for a push button switch formed with the vacuum forming etc. prepares the pocket section in the air beforehand, pours in thermosetting liquefied resin etc. after fabricating here, closes a display 2, prepares it in a desired configuration with metal mold, and forms a core material 22. Under the present circumstances, it is desirable to form the moisture absorption layer 17 which prevents enclosing drying agents, such as hygroscopic mold goods and films, such as polyamide resin, or silica gel, a zeolite, and barium oxide, and a display 2 absorbing moisture. Moreover, since oxygen permeability can absorb much oxygen well, polysilane, such as a poly methylphenyl silane besides oxygen absorbents, such as iron powder, vitamin C, and a catechol, is efficient, and especially the thing to establish for these oxygen uptake layers 18 is desirable.

[0076] [Gestalt 2 of implementation of invention] drawing 2 shows the member for a push button switch concerning the gestalt 2 of implementation of this invention.

[0077] The member 1 for a push button switch concerning the gestalt 2 of operation shown in drawing 2 forms the display 2 with an alphabetic character, a sign, or a pattern in the pars intermedia of the keytop section 3, and the field emitter 4 which carries out spontaneous light to a display 2 is used for it.

[0078] The keytop section 3 with the press projected part 8 which can press the center section of the dome section 23 of the contact sheet member 24 which formed the traveling contact 7 in the inner surface of the dome section 23 in which elastic deformation is possible so that a traveling contact 7 might be allotted to this stationary contact 6 and the location which counters to compensate for arrangement of the stationary contact 6 on the circuit board 5, and this contact sheet member 24 in the member 1 for a push button switch concerning the gestalt 2 of operation is formed in one.

[0079] Then, 1st resin Plastic solid 19 fabricated by the desired keytop configuration in the front face of the transparence insulation film 9 is formed in one, and the transparent electrode 10 is formed in the rear face of the transparence insulation film 9.

[0080] The transparence coloring layer 15 which formed the encaustic section of a display 2 in the part which hits a transparent electrode 10 in a rear face at the top panel section of the keytop section 3 in transparent coloring ink is formed. Although a display 2 is formed in a part of top panel section of the keytop section 3, the emitter layer 13 which consists of luminescent material is formed in the rear face of the transparence coloring layer 15, and the rear face of the transparent electrode 10 around the transparence coloring layer 15. Moreover, the \*\*SU electrode 14 by the silver paste is formed in the rear face of the emitter layer 13. 2nd resin Plastic solid 20 which is the core material which formed the press projected part 8 in the part which hits the rear-face center section of the keytop section 3 through the moisture absorption layer 17 is formed in the rear face of a base electrode 14 at one.

[0081] In addition, about the ingredient of each part material in the gestalt 2 of operation, since it is the same as that of the gestalt 1 of operation, refer to explanation of the gestalt 1 of operation.

[0082] Next, the manufacture approach of the member for a push button switch concerning the gestalt 2 of operation is explained.

[0083] First, the band-like transparent electrode 10 almost equal to the width of face of the top panel of a keytop 3 is formed in the part in which the keytop 3 of the rear face of the transparence insulation film 9 is located, and the encaustic section of a display 2 is formed in transparent coloring ink on this transparent electrode 10. Next, luminescent material is applied on the transparent electrode

10 by the side of the rear face of a keytop 3, and a display 2, and the emitter layer 13 is formed. Next, except for the part which hits in the center of the rear-face section of the keytop 3 of the emitter layer 13, the insulating ink which has protection-from-light nature and insulation is applied on the periphery section of the emitter layer 13, and a transparent electrode 10, and the opaque coloring layer 11 is formed. On the illuminant layer 13, a base electrode 14 is printed as a counterelectrode, and it stops in the printing area of the opaque coloring layer 11.

[0084] Next, size enlargement processing which set this printed sheet by the configuration of desired 2nd resin Plastic solid 20 by the compressed air and the vacuum forming, press forming, etc. is performed, and the size enlargement sheet which has the crevice in which 2nd resin Plastic solid 20 used as the core material of the keytop section 3 is formed is created.

[0085] Next, after forming the moisture absorption layer 17 which touches a base electrode 14 in the crevice of the size enlargement sheet fabricated by size enlargement processing, the configuration of 2nd resin Plastic solid 20 of pouring in the thermosetting resin which serves as a core material from on the, and having the press projected part 8 in the center section is molded and stiffened within metal mold.

[0086] Then, a traveling contact 7 is formed at the head of the press projected part 8 of 2nd resin Plastic solid 20 which is a core material by applying conductive ink, and the member 1 for a push button switch of the condition except 1st resin Plastic solid 19 is completed.

[0087] Next, to the front-face side of the location where the transparence insulation film 9 in which 2nd resin Plastic solid 20 which is a core material was formed corresponds, adhesion immobilization of 1st resin Plastic solid 19 which is the core material beforehand formed in the desired keytop configuration is carried out, and the member 1 for a push button switch is completed.

[0088] since it be maintain at the environment condition by which the emitter layer 13 be isolated from the external ambient atmosphere since the emitter layer 13 be arranged between 1st resin Plastic solid 19 and 2nd resin Plastic solid 20 and be prepared in the location of the pars intermedia of the keytop section 3, if it be in the gestalt 2 of operation, even if there be no effect receptacle \*\*\*\*\* of oxygen or humidity and it use it for a long period of time, the luminescence engine performance do not fall.

[0089] [Gestalt 3 of implementation of invention] drawing 3 shows the member for a push button switch concerning the gestalt 3 of implementation of this invention.

[0090] The member 1 for a push button switch concerning the gestalt 3 of operation shown in drawing 3 forms the display 2 with an alphabetic character, a sign, or a pattern in the pars intermedia of the keytop section 3, and the field emitter 4 which carries out spontaneous light to a display 2 is used for it.

[0091] In the member 1 for a push button switch concerning the gestalt 3 of operation, the transparence insulation film 9 is in a flat condition, 1st resin Plastic solid 19 fabricated by the configuration of a desired keytop is formed in the front face at one, and the transparent electrode 10 is formed in the rear face of the transparence insulation film 9. The transparent oxygen uptake layer 18 is formed between the transparence insulation film 9 and 1st resin Plastic solid 19.

[0092] The transparence coloring layer 15 which formed the encaustic section of a display 2 in the part which hits a transparent electrode 10 in a rear face at the top panel section of the keytop section 3 in transparent coloring ink is formed. Although a display 2 is formed in a part of top panel section of the keytop section 3, the emitter layer 13 which consists of luminescent material is formed in the rear face of the transparence coloring layer 15, and the rear face of the transparent electrode 10 around the transparence coloring layer 15. And the opaque coloring layer 11 which has protection-from-light nature and insulation is formed in the lateral portion of the emitter layer 13, and the rear face of a transparent electrode 10. Moreover, as the rear face of the emitter layer 13 and the end face of the opaque coloring layer 11 are covered, the \*\*SU electrode 14 by the silver paste is formed. 2nd resin Plastic solid 20 which is the core material which formed the press projected part 8 in the part which hits the rear-face center section of the keytop section 3 is formed in the rear face of a base electrode 14 at one. The moisture absorption layer 17 is formed between the base electrode 14 and 2nd resin Plastic solid 20.

[0093] In addition, about other members without the ingredient of each part material and explanation in the gestalt 3 of operation, since it is the same as that of the gestalt 1 of operation, or 2, the same sign is given to the same configuration and those explanation is omitted.

[0094] Next, the manufacture approach of the member for a push button switch concerning the gestalt 3 of operation is explained.

[0095] First, the band-like transparent electrode 10 almost equal to the width of face of the top panel of 1st resin Plastic solid 19 is formed in the part in which 2nd resin Plastic solid 20 which is the core material of the rear face of the transparence insulation film 9 is located, and the encaustic section of a display 2 is formed in transparent coloring ink on this transparent electrode 10. Next, luminescent material is applied on the transparent electrode 10 by the side of the rear face of a keytop 3, and a display 2, and the emitter layer 13 is formed. Next, the insulating ink which has protection-from-light nature and insulation is applied on the periphery section of the emitter layer 13, and a transparent electrode 10, and the opaque coloring layer 11 is formed. In the rear face of the illuminant layer 13, a base electrode 14 is printed as a counterelectrode, and it stops in the printing area of the opaque coloring layer 11. 2nd resin Plastic solid 20 which is the core material which formed the press projected part 8 in the center section through the moisture absorption layer 17 is formed in the rear face of a base electrode 14 at one.

[0096] Next, to the front-face side of the location where the transparence insulation film 9 in which 2nd resin Plastic solid 20 which is a core material was formed corresponds, it forms in the configuration of a desired keytop beforehand, adhesion immobilization of 1st resin Plastic solid 19 which is the core material which formed the oxygen uptake layer 18 in the part which touches the transparence insulation film 9 is carried out, and the member 1 for a push button switch is completed.

[0097] since it be maintain at the environment condition by which the emitter layer 13 be isolated from the external ambient atmosphere since the emitter layer 13 be arranged between 1st resin Plastic solid 19 and 2nd resin Plastic solid 20 and be prepared in the location of the pars intermedia of the keytop section 3, if it be in the gestalt 3 of operation, even if there be no effect receptacle \*\*\*\*\* of oxygen or humidity and it use it for a long period of time, the luminescence engine performance do not fall. Moreover, since the transparence insulation film 9, a transparent electrode 10, the opaque coloring layer 11, and a base electrode 14 continue being in a flat condition, and size enlargement processing of the keytop section 3 is unnecessary, conductive degradation of a transparent electrode 10 and a base electrode 14 does not arise.

[0098] By the way, idea \*\* also showed [ the design of the various displays 2 ] the typical thing to the gestalt 1 of operation thru/or the gestalt 3 of operation at drawing 4 thru/or drawing 13.

[0099] The 1st mode of the display 2 shown in drawing 4 has the inorganic oxide layer 21, the transparence insulation film 9, a



transparent electrode 10, the opaque coloring layer 11 that has the cutting die section 12, the transparence coloring layer 15 which buries the cutting die section 12, the illuminant layer 13, and the base electrode 14 in an order from the top. Here, the transparence coloring layer 15 forms the encaustic section, and the opaque coloring layer 11 forms the ground section.

[0100] The 2nd mode of the display 2 shown in drawing 5 has the inorganic oxide layer 21, the transparence insulation film 9, a transparent electrode 10, the opaque coloring layer 11 that forms the encaustic section, the transparence coloring layer 15 which constitutes the ground section, the illuminant layer 13, and the base electrode 14 in an order from the top.

[0101] The 3rd mode of the display 2 shown in drawing 6 has the opaque coloring layer 11 which constitutes the ground section which has the inorganic oxide layer 21, the transparence insulation film 9, a transparent electrode 10, and the cutting die section 12, the illuminant layer 13 which buries the cutting die section 12 and forms the encaustic section, and the base electrode 14 in an order from the top.

[0102] The 4th mode of the display 2 shown in drawing 7 has the inorganic oxide layer 21, the transparence insulation film 9, the transparent electrode 10, the transparence coloring layer 15 that forms the encaustic section, 2nd transparence coloring layer 15a which forms the ground section and the illuminant layer 13, and the base electrode 14 in an order from the top.

[0103] The 5th mode of the display 2 shown in drawing 8 has the illuminant layer 13 and base electrode 14 which bury the cutting die section 12 through coloring transparent electrode 10a which enters into the opaque coloring layer 11 which constitutes the ground section which has the inorganic oxide layer 21, the transparence insulation film 9, and the cutting die section 12, and the cutting die section 12, and forms the encaustic section, and coloring transparent electrode 10a in an order from a top.

[0104] The 6th mode of the display 2 shown in drawing 9 has the inorganic oxide layer 21, the transparence insulation film 9, the transparence coloring layer 15 that forms the encaustic section, the opaque coloring layer 11 which forms the ground section, a transparent electrode 10 and the illuminant layer 13, and the base electrode 14 in an order from the top.

[0105] The 7th mode of the display 2 shown in drawing 10 has coloring transparent electrode 10a which constitutes the bonnet ground section for the periphery of the inorganic oxide layer 21, the transparence insulation film 9, the opaque coloring layer 11 that constitutes the encaustic section, and the opaque coloring layer 11 in an order from a top, the illuminant layer 13, and the base electrode 14.

[0106] The 8th mode of the display 2 shown in drawing 11 has the inorganic oxide layer 21, the transparence insulation film 9, the opaque coloring layer 11 that constitutes the encaustic section, the transparence coloring layer 15 which constitutes the ground section, a transparent electrode 10 and the illuminant layer 13, and the base electrode 14 in an order from the top.

[0107] The 9th mode of the display 2 shown in drawing 12 has the inorganic oxide layer 21 which covers the keytop section 3 in an order from a top, 1st resin Plastic solid 19 which is a core material, the overcoat layer 16 (transparence insulating layer), the opaque coloring layer 11 which has the mold omission section 12 and constitutes the ground section, the transparent electrode 10 which constitutes the encaustic section, the illuminant layer 13, the base electrode 14, and the opaque insulation basic field 22.

[0108] The 10th mode of the display 2 shown in drawing 13 has the inorganic oxide layer 21 which covers the keytop section 3 in an order from a top, 1st resin Plastic solid 19 which is a core material, the overcoat layer 16 (transparence insulating layer), the opaque coloring layer 11 which has the mold omission section 12 and constitutes the ground section, the transparence coloring layer 15 which constitutes the encaustic section, the transparence insulation film 9, the transparent electrode 10, the illuminant layer 13, and the base electrode 14.

[0109] Among these, as for what the pattern [ that what was shown in drawing 4 , drawing 6 , drawing 7 drawing 8 , drawing 9 , drawing 12 , and drawing 13 consists of an alphabetic character, a sign, or a pattern ] section emits light, and was shown in drawing 5 , drawing 10 , and drawing 11 , the ground sections other than an alphabetic character, a sign, or a pattern emit light. Moreover, since what was shown in drawing 8 and drawing 10 does not need to color a transparent electrode 10, does not have to set to transparence coloring electrode 10a and does not need to use the transparence coloring layer 15 in this case, a production process becomes easy and it can reduce a manufacturing cost.

[0110] In addition, the transparence coloring layer 15 and the opaque coloring layer 11 have that good which uses elastic resin and an elastic elastomer as a binder, is what mixed the color and the pigment, sticks to the transparence insulation film 9, and is similarly ductile, and it is desirable to use resin like the transparence insulation film 9.

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[Translation done.]

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## EXAMPLE

[Example] The [example 1] example 1 is equivalent to the gestalt 1 of implementation of this invention.

[0112] First, one side of 100-micrometer polymethylmethacrylate (AKURIPUREN, product made from Mitsubishi Rayon) was made to distribute 3% of multi-wall nanotube (0.01 micrometers of wire sizes, 5micro of average line length, high peri-on company make) using a homogenizer to the solid content in the Pori (3, 4-ethylene dioxythiophene) (DENATORON 4001, Nagase& Co., Ltd. make) solution which doped sulfonated polystyrene, and transparent processing liquid was obtained.

[0113] Processing liquid was completely applied to one side of a film by the gravure coating machine, and the transparent electrode of 1-micrometer thickness was formed. In 70% (JIS-K7105) of total light transmission of this thing, they were surface-electrical-resistance 500ohm/\*\* (JIS-K6911). The ground section of a display 2 was removed with insulation in the black coloring ink which has electric shielding nature in the opaque coloring layer 11, the display 2 and the terminal area of a base electrode 14 were removed by screen-stencil, and it applied to the whole surface. Pori (2-methoxy-5-ethylhexyloxy) -1, The LEC ink which consists of 4-phenylenevinylene, polyethylene oxide, a lithium triphloromethanesulfonate salt, a cyclohexanone, and ethyl alcohol by printing like the opening part minimum of the ground section the 18-micrometer emitter layer 13. Subsequently, the terminal electrode connected with the base electrode 14 which turns into a counterelectrode on the illuminant layer 13, and it was prepared in the opaque coloring layer 11 with a silver paste (DODENTO NH-030A, a thermoplastic polyamide binder, product made from Japan Pewter). After this presswork termination, the vacuum dryer could be used, it was made to dry and the printing film was obtained.

[0114] Using the metal mold which has 12 mold cavities which have the diameter of 12mm, a depth of 78mm, and a base R50mm concave bend side, and the male which consists of an elastic body of 90 degrees of hardness (Shore A) which carried out templating by this, the metal piece with a diameter of 8mm was put on the display for heat insulation, it heated at 110 degrees C with infrared radiation, the metal piece was removed, and the printing film was promptly pressed between the colds.

[0115] After removing a male, initial-complement casting of the poly methylphenyl silane and liquefied epoxy resin which mixed barium-oxide powder as a core material 22 was carried out, and the press projected part 8 was fabricated to the core material 22 with the 2nd male which has the cross-section configuration shown in drawing 1.

[0116] Next, the mask of the electrode terminal was carried out, aluminum was processed by the ion plating method in the oxygen ambient atmosphere, the aluminum oxide was formed in the Plastic solid front face, adhesion formation of the trimethoxysilane was carried out by the gaseous-phase method, and the member 1 for a push button switch was obtained.

[0117] When the electrode terminal of the member 1 for a push button switch and the electrode terminal on the circuit board 5 were set and laid and direct-current 6V were impressed to the emitter layer 13, the display 2 presented luminescence altogether, brightness was 62 nits, and the half-life was 1225H.

[0118] The [example 2] example 2 is equivalent to the gestalt 1 of implementation of this invention.

[0119] First, 100-micrometer polymethylmethacrylate (AKURIPUREN) It is 1/6-mol sulfonation DIN DORIMA (to one mol of the DIN DORIMA trade name (PA) DAB 8 used as starting material, the diamino butane and cyanoethylene of a DSM company) of the structural unit to the poly aniline in one side made from Mitsubishi Rayon. In the DMF solution which mixed the thing to which eight mols of benzenesulfonic acid were made to react It is 3% of multi-wall nanotube (0.01 micrometers of wire sizes) to the solid content. 5micro of average line length, high peri-on company make, and azo dye (Permanent Red 4R, product made from San-yo Coloring matter) — solid content — receiving — 0.1wt(s)% — added, it was made to distribute using a homogenizer and the processing liquid of transparent red was obtained.

[0120] Processing liquid was completely applied to one side of a film by the gravure coating machine, and the red transparent electrode 10 of 1-micrometer thickness was formed. Furthermore, the conductive polymer solution which is not colored was applied to the perimeter of a display 2 by 1-micrometer screen-stencil. The total light transmission of this thing was 72% (JIS-K7105), and surface electrical resistance was 600ohm/\*\* (JIS-K6911). The ground section of a display 2 was removed in the black coloring ink which has electric shielding nature and insulation in the opaque coloring layer 11, the display 2 and the electrode terminal area of a base electrode 14 were removed by screen-stencil, and it applied to the whole surface. The 20-micrometer emitter layer 13 was formed for the LEC ink which consists of Pori (2-methoxy-5-ethylhexyloxy) -1, 4-phenylenevinylene and Pori (9 and 9-G n-hexyl FUORENIRU -2, 7'-diyl), polyethylene oxide, a lithium triphloromethanesulfonate salt, a cyclohexanone, and ethyl alcohol by printing like the opening part minimum of the ground section.

[0121] next, 0.15 mol % of vinyl groups — the included poly dimethylsiloxane (KE-78VBS, Shin-Etsu Chemical Co., Ltd. make) — silver powder (made in [ Fukuda Metal Foil & Powder ] a silt coat) — solid content — receiving — 75wt(s)% — the electrode terminal connected with a counterelectrode with a thickness of 50 micrometers and it on the emitter layer 13 was prepared in the opaque coloring layer 11 with the conductive ink which consists of an included kerosine solution. After this presswork termination, the 60-degree C vacuum dryer could be used, it was made to dry and the printing film was obtained.

[0122] When the same metal mold as an example 1 performs compression molding and size enlargement of the keytop section 3 was carried out, with the drawing of the transparence insulation film 9, the conductive ink which consists of this unvulcanized silicone rubber also flowed, and carried out size enlargement.

[0123] About 0.3 cc casting was carried out, at 120 degrees C, it is made to react with silicone rubber, and a 60-degree C vacuum dryer may be used, and the vinyl ester resin (made in [ Dow Chemical Co. ] Diller Ken 411) which mixed permutite powder, iron powder,

and benzoyl peroxide as a core material 22 was dried. Furthermore, initial-complement casting of the vinyl ester resin containing benzoyl peroxide was carried out, and the press projected part 8 was fabricated to the core material 22 with the 2nd male which has the cross-section configuration shown in drawing 1.

[0124] an electrode terminal — a mask — carrying out — a polysilazane steam — for [ 25 degrees-C ] 5 minutes — hitting — a gaseous-phase method — adhesion — it saved in the layer of 25-degree-C50%RH, and was made to convert into precise silicon oxide one whole day and night. Furthermore, this Plastic solid was soaked in the alcoholic solution (solid content 1wt%) of mercapto propyltrimethoxysilane, and was dried promptly, and the member 1 for a push button switch was obtained.

[0125] When the electrode terminal of the member 1 for a push button switch and the electrode terminal on the circuit board 5 were set and laid and direct-current 6V were impressed to the emitter layer 13, the display 2 presented luminescence altogether and the half-life of brightness was 1360H in 60 nits.

[0126] The [example 3] example 3 is equivalent to the gestalt 2 of implementation of this invention.

[0127] first, one side of 250-micrometer polyethylene terephthalate (lumiler, Toray Industries, Inc. make) — silicon oxide was formed in one side and the other side of the electrode 10 and the inorganic oxide layer 21 were acid ghost by the ion plating method, respectively. The total light transmission of this thing was 80% (JIS-K7105), and surface electrical resistance was 100ohm/\*\* (JIS-K6911).

[0128] The kino lysine derivative (NKX-1768, made in Sensitizing dye Lab) was mixed as color conversion coloring matter to thermoplastic polyester (SUTAFKKUSU PLC, product made from Fuji Photo Film Industry), and the ink for transparence coloring layers was adjusted. On the transparent electrode 10, the transparence coloring layer 15 was printed by screen-stencil.

[0129] Subsequently, Pori [9 -(3, 6, 9-trioxa DESHIRU)- The 1.5-micrometer emitter layer 13 was formed by ink jet printing so that the transparence coloring layer 15 might be covered in the LEC ink which consists of a carbazole -3, and 6-diyl], oxyethylene cyclo tris phosphazene, toluenesulfonic acid sodium salt and a pyridine.

[0130] Next, in the same black ink as an example 1, formed the insulating layer in the part except the center section and electrode terminal of the emitter layer 13 by screen-stencil, and a vacuum dryer may be used, it was made to dry, and the printing film was obtained. The mask of the part for an electrode terminal area was carried out, aluminum was vapor-deposited, and the conductive layer which consists of carbon ink was further formed on it.

[0131] With the male which has the same cross-section configuration as what is shown in drawing 2, the press projected part 8 was fabricated to 2nd resin Plastic solid 20 which is a core material, the keytop section 3 which consists of acrylic resin further was stuck with 2 acidity-or-alkalinity acrylic adhesives, and the member 1 for a push button switch was obtained.

[0132] When the electrode terminal of the member 1 for a push button switch and the electrode terminal on the circuit board 5 were set and laid and direct-current 5V were impressed to the emitter layer 13, the display 2 presented luminescence altogether, brightness was 75 nits, and the half-life was 1300H.

[0133] The [example 4] example 4 is equivalent to the gestalt 3 of implementation of this invention.

[0134] First, the 15-micrometer ethylene vinyl alcohol copolymer film was laminated as a transparence insulation film 9 to both sides of the 100-micrometer polypropylene film which performed double-sided plasma treatment. The ground section of a display 2 was removed in green opaque coloring ink, the display 2 was removed by screen-stencil, and it applied to the whole surface. The electrode terminal connected with a display 2 and it by ink jet printing in the Pori (3, 4-ethylene dioxythiophene) solution containing the dopant to which the 1/6-mol sulfonation fullerene (the mixed fullerene of C60 and C70, product made from MER) and the oleum of a structural unit of Pori (3, 4-ethylene dioxythiophene) were moreover made to react was formed. Furthermore, the 5-micrometer base electrode 14 was printed so that this formed poly thiophene layer might be covered for the silver paste used in the example 1 from the perimeter of a display 2 to an electrode terminal area. The total light transmission of a transparent electrode 10 is 65% (JIS-K7105), and surface electrical resistance formed the emitter layer 13 with a thickness of 2.0 micrometers so that a transparent electrode 10 might be similarly covered for the ink for LEC which consists of Pori (the p-phenylene -2, 6-benzimidazole) and polyethylene oxide which were 500ohm/\*\* (JIS-K6911), and toluenesulfonic acid lithium salt by ink jet printing. Subsequently, the electrode terminal connected with the base electrode 14 of the illuminant layer 13 and it was detached and formed from the formative layer of the display 2 of the keytop section 3 in the conductive ink which mixed silver powder with thermoplastic polyester (made in [ Toyobo Co., Ltd. ] Byron GV100) with a melting point of 86 degrees C. After this presswork termination, the vacuum dryer could be used, it was made to dry and the printing film was obtained.

[0135] Using the female mold which has 15 mold cavities with flat 3mmx5mm and base with a depth of 1mm which it has, and the male with which 2.8mmx4.8mm and a top panel with a height of 0.9mm have a flat configuration, the 2.6mmx4.6mm metal piece was put on the display 2 for heat insulation, it heated at 120 degrees C with infrared radiation, the metal piece was removed, and compression molding was promptly performed for the printing film between the colds. When size enlargement of the keytop section 3 was carried out, with the drawing of the transparence insulation film 9, the conductive ink which consists of thermoplastic polyester also flowed, and size enlargement was carried out.

[0136] After removing a male, initial-complement casting of the liquefied epoxy resin which contains 50wt(s)% iron powder as a deoxidizer was carried out, and the press projected part 8 was fabricated to 2nd resin Plastic solid 20 which is a core material with the 2nd male which has the same cross-section configuration as what is shown in drawing 3. Furthermore, the keytop section 3 which consists of acrylic resin was stuck with 2 acidity-or-alkalinity acrylic adhesives. Dipped into the phenyl silanol solution which carries out the mask of the electrode terminal of the acquired Plastic solid, and makes an amino silanol a catalyst, it was made to dry and react at 40 degrees C promptly, the silica layer of 2-micrometer thickness was formed in the Plastic solid front face, and the uniform member 1 for a push button switch was obtained.

[0137] When the electrode terminal of the member 1 for a push button switch and the electrode terminal on the circuit board 5 were set and laid and direct-current 4V were impressed to the emitter layer 13, the display 2 presented luminescence altogether and the half-life of brightness was 2300H in 65 nits.

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**DESCRIPTION OF DRAWINGS**

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**[Brief Description of the Drawings]**

**[Drawing 1]** It is the important section sectional view having shown the member for a push button switch concerning the gestalt 1 of implementation of this invention.

**[Drawing 2]** It is the important section sectional view having shown the member for a push button switch concerning the gestalt 2 of this operation.

**[Drawing 3]** It is the important section sectional view having shown the member for a push button switch concerning the gestalt 3 of this operation.

**[Drawing 4]** It is the important section sectional view having shown the 1st mode of the display of the member for a push button switch concerning this invention.

**[Drawing 5]** It is the important section sectional view having shown the 2nd mode of this display.

**[Drawing 6]** It is the important section sectional view having shown the 3rd mode of this display.

**[Drawing 7]** It is the important section sectional view having shown the 4th mode of this display.

**[Drawing 8]** It is the important section sectional view having shown the 5th mode of this display.

**[Drawing 9]** It is the important section sectional view having shown the 6th mode of this display.

**[Drawing 10]** It is the important section sectional view having shown the 7th mode of this display.

**[Drawing 11]** It is the important section sectional view having shown the 8th mode of this display.

**[Drawing 12]** It is the important section sectional view having shown the 9th mode of this display.

**[Drawing 13]** It is the important section sectional view having shown the 10th mode of this display.

**[Drawing 14]** It is the important section sectional view of the member for a push button switch which used the light emitting diode for the conventional light source.

**[Drawing 15]** It is the important section sectional view of the member for a push button switch which used the electric bulb for the conventional light source.

**[Drawing 16]** It is the important section sectional view of the member for a push button switch which adopted the conventional light guide section material.

**[Drawing 17]** It is the important section sectional view of the member for a push button switch which used EL sheet for the conventional light source.

**[Description of Notations]**

1 Member for Push Button Switch

2 Display

3 Keytop Section

4 Field Emitter

5 Circuit Board

6 Stationary Contact

7 Traveling Contact

8 Press Projected Part

9 Transparence Insulation Film

10 Transparent Electrode

11 Opaque Coloring Layer (Insulating Layer)

12 Cutting Die Section

13 Emitter Layer (Insulating Layer)

14 Base Electrode

15 Transparence Coloring Layer (Insulating Layer)

17 Moisture Absorption Layer

18 Oxygen Uptake Layer

19 1st Resin Plastic Solid (Core Material)

20 2nd Resin Plastic Solid (Core Material)

21 Inorganic Oxide Layer

22 Core Material

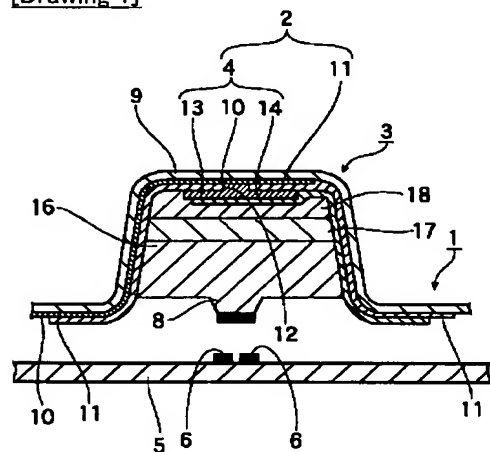
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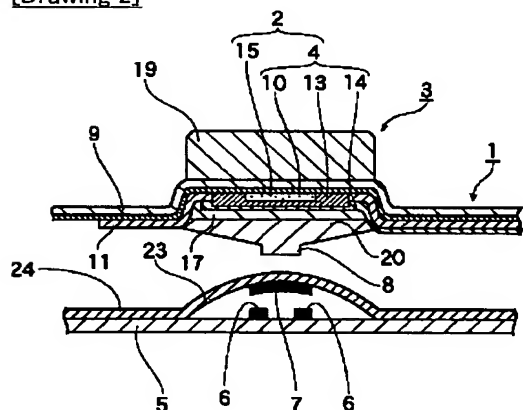
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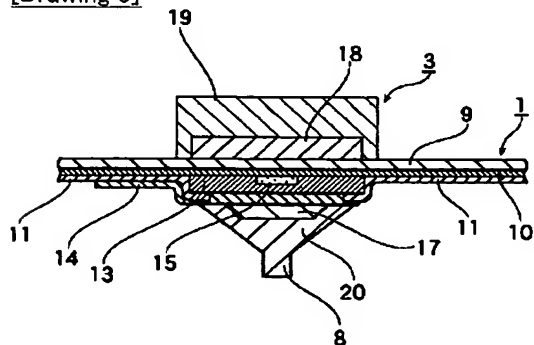
[Drawing 1]



**[Drawing 2]**

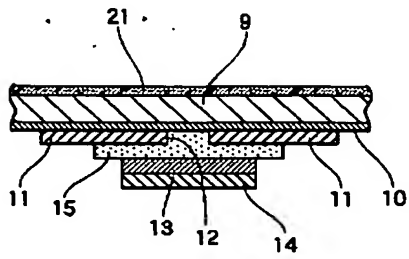


**[Drawing 3]**

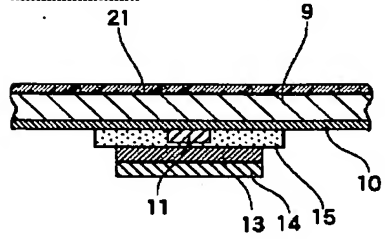


[Drawing 4]

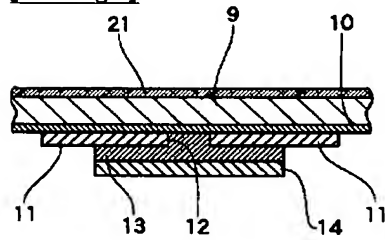




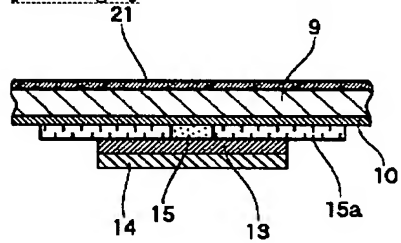
[Drawing 5]



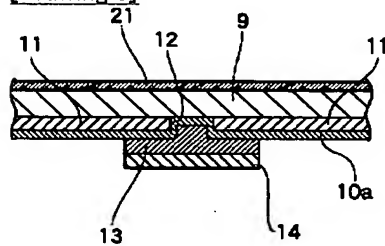
[Drawing 6]



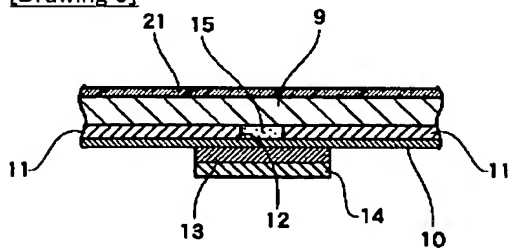
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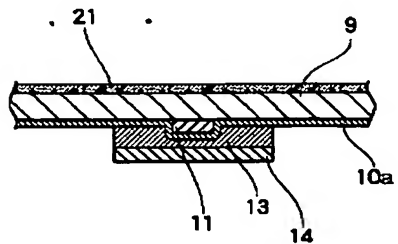
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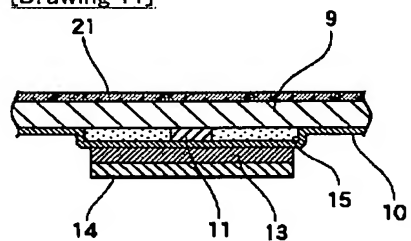
[Drawing 9]



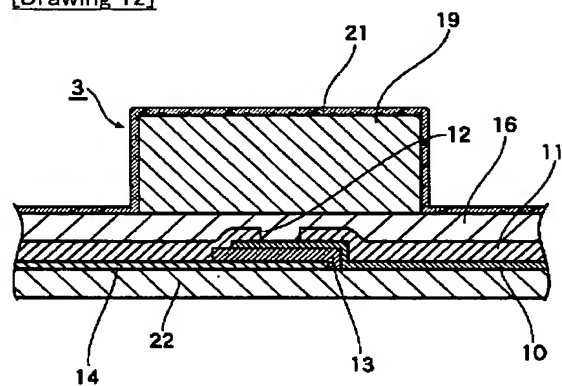
[Drawing 10]



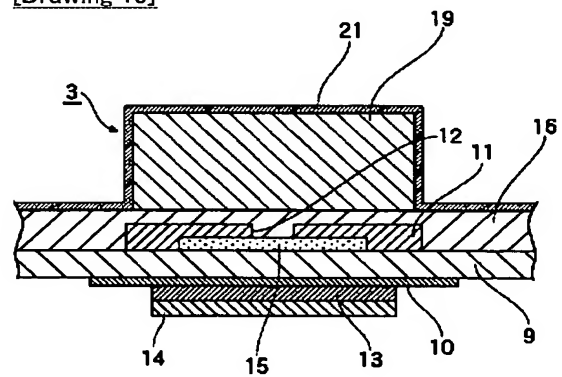
[Drawing 11]



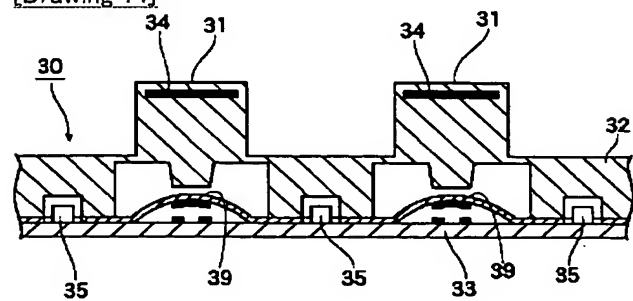
[Drawing 12]



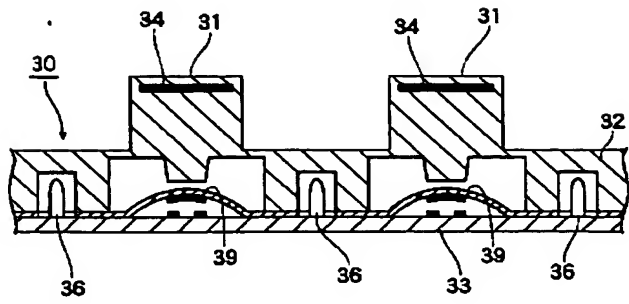
[Drawing 13]



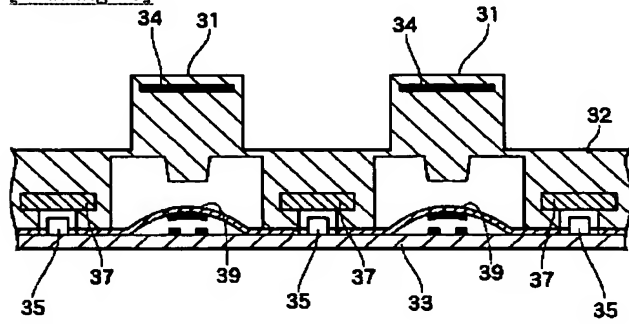
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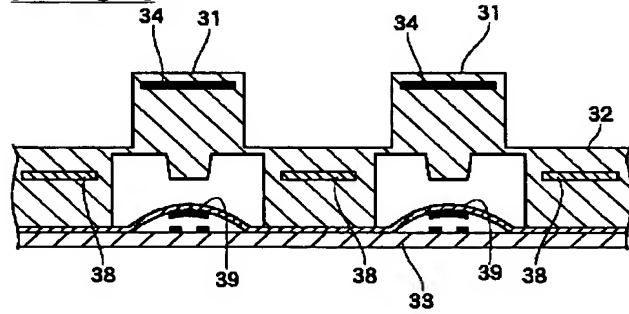
[Drawing 15]



[Drawing 16]



[Drawing 17]



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(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号  
特開2002-367469  
(P2002-367469A)

(43) 公開日 平成14年12月20日 (2002. 12. 20)

(51) Int.Cl. <sup>7</sup>	識別記号	F I	テマコード* (参考)
H 0 1 H 13/02		H 0 1 H 13/02	A 5 G 0 0 6
9/18		9/18	B 5 G 0 2 3
11/00		11/00	E 5 G 0 5 2
13/14		13/14	Z
13/70		13/70	F
審査請求 未請求 請求項の数12 O L (全 16 頁)			

(21) 出願番号 特願2001-175768 (P2001-175768)

(22) 出願日 平成13年6月11日 (2001. 6. 11)

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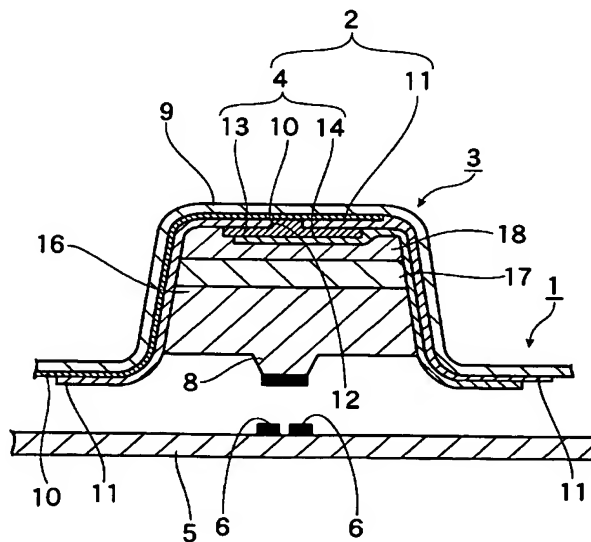
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(54) 【発明の名称】 押釦スイッチ用部材とその製造方法

(57) 【要約】

【課題】 光エネルギーを無駄なく表示部の照光に使用することで、消費電力を押さえながらも輝度むらのない表示部の照光が実現でき、直流で駆動する面発光体を使用することで厚みの薄くて軽い押釦スイッチ用部材とその製造方法を提供する。

【解決手段】 回路基板5上の固定接点6に対向して配置される可動接点7を固定接点6に接触させる方向に押圧するためのキートップ部3と、該キートップ部3を所定の位置に配して回路基板5に取り付けるためのカバー基材とを有し、キートップ部3にスイッチ機能を表示する表示部2と一体の面発光体4とを有する押釦スイッチ用部材1であって、面発光体4を電気化学発光体とした。



## 【特許請求の範囲】

【請求項1】 回路基板上の固定接点に対向して配置される可動接点を前記固定接点に接触させる方向に押圧するためのキートップ部と、該キートップ部を所定の位置に配して前記回路基板上に取り付けるためのカバー基材とを有し、前記キートップ部には、スイッチ機能を表示する表示部と、該表示部に一体の面発光体とを有する押釦スイッチ用部材であって、前記面発光体が電気化学発光体であることを特徴とする押釦スイッチ用部材。

【請求項2】 前記キートップ部は、芯材と該芯材を被覆する透明絶縁性フィルムとを有し、前記面発光体は、ベース電極と該ベース電極に対向する透明電極との間に発光体層を有し、前記ベース電極の電極端子及び前記透明電極の電極端子を前記キートップ部以外の部分まで延長して配置したことを特徴とする請求項1に記載の押釦スイッチ用部材。

【請求項3】 前記ベース電極が導電性粒子と絶縁性樹脂とからなる導電性インクであることを特徴とする請求項2に記載の押釦スイッチ用部材。

【請求項4】 前記透明電極は、透明絶縁性基体に透明導電性ポリマー層を形成してなり、該透明電極に接して前記発光層体が形成されていることを特徴とする請求項2に記載の押釦スイッチ用部材。

【請求項5】 前記透明導電性ポリマー層が着色されていることを特徴とする請求項4に記載の押釦スイッチ用部材。

【請求項6】 前記押釦スイッチ用部材の外表面の少なくとも一部分に無機酸化物層が形成されていることを特徴とする請求項1乃至5のいずれか1つに記載の押釦スイッチ用部材。

【請求項7】 前記無機酸化物層の外表面に有機物層を設けてなることを特徴とする請求項6に記載の押釦スイッチ用部材。

【請求項8】 前記無機酸化物層がポリシラザンを転化してなるものであることを特徴とする請求項6又は7に記載の押釦スイッチ用部材。

【請求項9】 前記ベース電極と前記キートップ部の心材との間に吸湿層を設けたことを特徴とする請求項6乃至8のいずれか1つに記載の押釦スイッチ用部材。

【請求項10】 前記ベース電極と前記キートップ部の心材との間に酸素吸収層を設けたことを特徴とする請求項9に記載の押釦スイッチ用部材。

【請求項11】 請求項1乃至10のいずれか1つに記載の押釦スイッチ用部材の製造方法であって、前記ベース電極が導電性粒子と絶縁性樹脂とからなる導電性インクによって形成され、該導電性インクを塑性流動状態で賦形したことを特徴とする押釦スイッチ用部材の製造方法。

【請求項12】 請求項1乃至10のいずれか1つに記載の押釦スイッチ用部材の製造方法であって、前記発光

体層、前記透明電極、前記ベース電極或いは前記表示部の模様部又は地部を構成する着色層のうち、少なくとも3種を平面状の透明絶縁性フィルム上に形成した後、キートップ部と電極端子部とを賦形してなることを特徴とする押釦スイッチ用部材の製造方法。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】この発明は、携帯電話、PDA等の携帯端末、電話機、カーステレオ、車載用ボードコンピュータ、オーディオ、計測器、パーソナルコンピュータ、ホームシアター用リモコン等の入力装置に用いられ、この入力装置のキートップ部にそれぞれを識別する或いはスイッチ機能を表示する表示部を有する押釦スイッチ用部材に関するものであり、より詳しくは、暗い所で表示部を照らし出すことのできる照光式の押釦スイッチ用部材とその製造方法に関するものである。

## 【0002】

【従来の技術】従来、この種の入力装置に用いられる押釦スイッチ用部材は、夜間時の使用において押釦スイッチの機能を示した表示部を照光するいわゆる照光機能が必要とされている。

【0003】例えば、携帯電話機等の入力装置に使用される押釦スイッチ30では、図14又は図15に示したように、操作キーを構成する複数のキートップ部31を一体に形成したカバー基材32と回路基板33とが向かい合った状態で、目的とする入力装置の筐体内に組み込まれて押釦スイッチ30のスイッチ機能を実現できるようにしている。そして、暗い所でも押釦スイッチ30の機能がわかるように、各々の操作キーとなるのキートップ部31の天面部又は裏面部には、それぞれのスイッチ機能に応じた文字、符号又は図柄等の表示を施した表示部34が設けられており、回路基板33上に設けたLED35や電球36等の光源から発せられる直射光及びこの直射光が周辺の部材に反射して生じる反射光がキートップ部31の裏面部から天面部に透過することで、表示部34の表示内容が浮かび上がって視認できるようになっている。これにより、夜間時でも支障なく携帯電話等を使用することができる。

【0004】また、より均一な明るさが要求される場合には、図16又は図17に示したように、LED35とキートップ部31との間に薄板上の導光部材37を挿入したり、光源として面発光するEL（エレクトロルミネセンス）シート38を使用することで発光表面積を大きくすることが試みられていた。

【0005】しかしながら、LED35、電球36、ELシート38等の光源及び光源からの直射光を導く導光部材37は、回路基板33上の接点部39とキートップ部31との接触動作を阻害することのないよう、キートップ部31から離れた所に配置されているため、光源35、36、38や導光部材37と表示部34とが離れた

位置関係となり、LED35や電球36の数を増やしたり、導光部材37を補ったり、或いはELシート38を用いた場合にあっては、部品点数が増加することによる設計の困難性が高くなる割には、暗い所で表示部34の表示内容を確認するだけの十分な光量を供給できない場合が生じ、その実効性に乏しかった。

【0006】特に、電池駆動する携帯電話機にあっては、低消費電力が求められており、少ない数の光源で十分な光量を確保することが望まれるが、上述した従来の方法では光源から発せられる光の一部しか表示部34の視認性向上に寄与できず、大きな消費電力を使用しても視認性を向上することができないといった矛盾が生じていた。

【0007】さらに、キートップ部31とこれに対応する固定基板33に設けた接点部39の間に、光源35、36、38や導光部材37を設けるため押釦スイッチ30の厚みを薄くすることができず、ひいては入力装置や機器本体の厚みを薄くすることに制約が生じると共に重量の増加を招くこととなっていた。

【0008】

【発明が解決しようとする課題】そこで、以上のような不具合を解消するため、特開平11-232954号公報又は特開2000-285760号公報に記載された発明のように、キートップ部の天面部に自発光する面発光体を設けて表示部の近傍に光源を取り付けることで、光の拡散と障害物による光量の損失を防ぐ工夫が行われているものが知られている。

【0009】そして、これらの面発光体は高誘電有機物質中に、無機の発光体粉末を分散させた、有機分散型EL（無機EL）であるため、駆動のために交流を印加している。

【0010】また、表示部がキートップ部の天面部に位置するため、透明絶縁性基体上に透明電極、表示部或いは第2の電極を予め設け、絞り加工等によって成形するが、透明絶縁性基体が延伸されるに伴い、電極材料等も延伸され、透明電極の抵抗値の上昇を抑える工夫がなされている。

しかしながら、これら表示部が発光する従来の押釦スイッチ用部材は、有機分散型EL（無機EL）を使用しているため、携帯端末等の直流電源しか所有していない機器は、これを交流変換し、さらに昇圧しなければならず、余分な部品及びそのスペースを必要とするため、限られた製品にしか使用できなかった。さらに、交流で駆動されているため、振動やノイズの発生があり、携帯電話等では、使用に不快感や通信障害などの不具合が生じている。

【0011】また、エネルギー的にも、特に電池駆動する携帯端末等では、より低消費電力が求められるが、電気-光変換効率も低く、電池の寿命を早めており、使い勝手が悪かった。

【0012】さらに、電極材料は透明導電セラミックス層をスパッタリングで設け、或いは高価な粉末を有機バインダーに分散させてなる透明電極を用いているため、成形時に抵抗値が甚だ大きくなり、表示部が点灯しないという不利不具合があるため、工業的に実用のレベルに達していない。

【0013】そこで、この発明は、以上のような従来のキートップ部の表示部を照光する押釦スイッチ用部材の問題を解消するために考えられたものであって、光エネルギーを無駄なく表示部の照光に使用することで、消費電力を押さえながらも輝度むらのない表示部の照光が実現でき、直流で駆動する面発光体を使用することで厚みの薄くて軽い押釦スイッチ用部材とその製造方法を提供することを課題としている。

【0014】

【課題を解決するための手段】上記課題を解決するために、請求項1に記載の発明は、回路基板上の固定接点に対向して配置される可動接点を前記固定接点に接触させる方向に押圧するためのキートップ部と、該キートップ部を所定の位置に配して前記回路基板上に取り付けるためのカバー基材とを有し、前記キートップ部には、スイッチ機能を表示する表示部と、該表示部に一体の面発光体とを有する押釦スイッチ用部材であって、前記面発光体が電気化学発光体であることを特徴としている。

【0015】請求項2に記載の発明は、請求項1の構成に加えて、前記キートップ部は、芯材と該芯材を被覆する透明絶縁性フィルムとを有し、前記面発光体は、ベース電極と該ベース電極に対向する透明電極との間に発光体層を有し、前記ベース電極の電極端子及び前記透明電極の電極端子を前記キートップ部以外の部分まで延長して配置したことを特徴としている。

【0016】請求項3に記載の発明は、請求項2の構成に加えて、前記ベース電極が導電性粒子と絶縁性樹脂とからなる導電性インクであることを特徴としている。

【0017】請求項4に記載の発明は、請求項2の構成に加えて、前記透明電極は透明絶縁性基体に透明導電性ポリマー層を形成してなり、該透明電極に接して前記発光層体が形成されていることを特徴としている。

【0018】請求項5に記載の発明は、請求項4の構成に加えて、前記透明導電性ポリマー層が着色されていることを特徴としている。

【0019】請求項6に記載の発明は、請求項1乃至5いずれか1つの構成に加えて、前記押釦スイッチ用部材の外表面の少なくとも一部分に無機酸化物質が形成されていることを特徴としている。

【0020】請求項7に記載の発明は、請求項6の構成に加えて、前記無機酸化物質の外表面に有機物層を設けてなることを特徴としている。

【0021】請求項8に記載の発明は、請求項6又は7の構成に加えて、前記無機酸化物質がポリシラザンを転



化してなるものであることを特徴としている。

【0022】請求項9に記載の発明は、請求項6乃至8のいずれか1つの構成に加えて、前記ベース電極と前記キートップ部の心材との間に吸湿層を設けたことを特徴としている。

【0023】請求項10に記載の発明は、請求項9の構成に加えて、前記ベース電極と前記キートップ部の心材との間に酸素吸収層を設けたことを特徴としている。

【0024】請求項11に記載の発明は、請求項1乃至10のいずれか1つに記載の押釦スイッチ用部材の製造方法であって、前記ベース電極が導電性粒子と絶縁性樹脂とからなる導電性インクによって形成され、該導電性インクを塑性流動状態で賦形したことを特徴としている。

【0025】請求項12に記載の発明は、請求項1乃至10のいずれか1つに記載の押釦スイッチ用部材の製造方法であって、前記発光体層、前記透明電極、前記ベース電極或いは前記表示部の模様部又は地部を構成する着色層のうち、少なくとも3種を平面状の透明絶縁性フィルム上に形成した後、キートップ部と電極端子部とを賦形してなることを特徴としている。

【0026】

【発明の実施の形態】以下、この発明の実施の形態について図1乃至図13によって説明する。

【0027】〔発明の実施の形態1〕図1は、この発明の実施の形態1に係る押釦スイッチ用部材を示した要部断面図である。

【0028】図1に示した実施の形態1に係る押釦スイッチ用部材1は、文字、符号又は図柄等によるスイッチ機能を表示した表示部2をキートップ部3の天面部側に設けたものであって、表示部2に自発光する面発光体4を採用したものである。

【0029】実施の形態1に係る押釦スイッチ用部材1には、回路基板5上の固定接点6に対向させて配置される可動接点7が設けられている。具体的には、キートップ部3の裏面部中央に設けた押圧突部8の先端に可動接点7を形成し、キートップ部3を回路基板5側へ押圧することにより可動接点7が固定接点6へ接触できるようにしている。

【0030】また、キートップ部3の外周部でかつ押釦スイッチ用部材1と回路基板5との間には、所定の位置に配された複数のキートップ部3を一体に形成したシリコーンゴム等の弾性材料のカバー基材（図示せず）が設けられており、キートップ部3を押圧した際にカバー基材の一部が回路基板5側に弾性変形して、キートップ部3から手を離れた際にカバー基材の弾性復元力によりキートップ部3が元の位置に復帰できるようにしている。

【0031】押釦スイッチ用部材1は必要により複数のキートップ部3が配置されており、エルゴノミックデザイン等の点から、3次元の複雑な形状を有している場合

が多く、キートップ部3の天面部は、キートップ部3以外の部分より隆起した形状となり、入力装置の筐体に設けられた開口部（図示せず）から突出している。表示部2は数字、文字又は図柄等が採用され、キートップ部3の識別機能或いはキートップ部3のスイッチ機能の説明を示すものが使われる。これら表示部2は、例えば文字色（模様部）と文字以外の背景色（地部）との色差によって識別されるが、必要に応じて視認性のよい色合いが選択されることとなる。

10 【0032】例えば、1つのキートップ部3に数字とアルファベット等複数の表示部2を有し、これを切り替えて、別々の発光色で発光させることにより、多くの機能を有するキートップ部3の操作を区別することができ、スイッチ機能をより操作し易くできる。表示部2は、暗い所での視認性を向上させるため、又は入力確認のため照光されるが、文字が照光したり、背景が照光したり、文字及び背景の両方を照光する等、そのデザインは自由に決定される。照光の輝度は、発光色により異なるが、おおよそ10～100ニト（nt）である。

20 【0033】キートップ部3の実質的な形状を決定するキートップ部3の芯材22の材料は硬質又は軟質樹脂或いはエラストマー等から選ばれる。熱可塑性又は熱硬化性のいずれでもよく、フィルム状、ペレット状、液状等素材の形態に限定されることもないが、液状熱硬化性樹脂は注入作業が容易であり好ましい。

【0034】キートップ部3の裏面部を除いた押釦スイッチ用部材1の外周表面には、透明絶縁性フィルム9が被覆されており、この透明絶縁性フィルム9の裏面にはキートップ部3の側面からキートップ部3の天面部に達する範囲で、面発光体4の一方の電極となる透明電極10が設けられている。透明電極10の裏面及び透明電極10が設けられていない透明絶縁性フィルム9の裏面には、遮光性及び絶縁性を有する不透明着色層11が設けられている。

【0035】そして、不透明着色層11には表示部2の文字、符号又は図柄等の形態に合わせた抜き型部12が形成されている。不透明着色層11の裏面には、抜き型部12を含めたキートップ部3の天面部の大きさより僅かに小さな大きさの発光体層13を設けている。したがって、抜き型部12は発光体層13で埋められ、文字、符号又は図柄等からなる模様部が形成され、この模様部と抜き型部12の周囲の不透明着色層11からなる地部とによって表示部2のデザインが完成されることになる。そして、発光体層13の裏面には、もう一方の電極を形成するベース電極14を設けている。

【0036】また、ベース電極14及び不透明着色層11の裏面とキートップ部3の芯材22との間には、酸素吸収層18と吸湿層17とが重なるようにして形成されている。これにより、発光体層13を酸素と湿度から保護してその品質を長期に維持できるようにしている。

【0037】表示部2自体が発光する構造は、表示部2の領域を均一に発光させ、樹脂の成形体との複合化が容易な、LEC (Light Emitting Electrochemical Cell、電気化学発光) 体からなり、直接、可視発光するものや、可視光外、例えば紫外発光をし、これを可視発光に変換したもの等が含まれる。

【0038】LECは対向する少なくとも一方が透明の2電極(透明電極10とベース電極14)間に、約0.5~50 $\mu$ mの発光体層13を挟持させた構造で、発光体層13はポリチオフェン、ポリフェニレン、ポリフェニレンビニレン、ポリピロール、ポリアセチレン、ポリビニレン等の誘導体、共役ポリマーやオリゴマーと或いはレーザー色素等とエチレンオキシド、フォスファゼン、プロピレンオキシド、ジメチルシロキサン、オキシメチレン、エピクロロヒドラン、オキセタン、テトラヒドロフラン1, 3-ジオキソラン、エチレニミン、エチレンサクシネート、エチレンスルホネート、オキシエチレンメタクリレート、オキシエチレンシクロトリスホスファゼン等のポリマー或いはオリゴマーの電解質物質とトリフロロメタンスルホン酸リチウム塩等の金属塩を混合したものである。この他、アルカリ金属、アルカリ土類金属、アルミニウム、銀、銅、コバルト、亜鉛、アンモニウム、テトラメチルアンモニウム、フェニルアンモニウム等と、ハロゲン、過塩素酸、硝酸、硫酸、燐酸、ホウ酸等の無機酸やトリフロロメタンスルホンアミド、酢酸、トルエンスルホン酸、サリチル酸、安息香酸等の有機酸とからなる塩が挙げられる。

【0039】混合には、電解質の中を、先の塩のカチオン、アニオンが移動できる状態にするため、共役ポリマーと電解質とが相をなし、セルの大きさが10~100nm程度の網状に形成するため、トルエン、ピルジン、アセトニトリル、オクチルシアノアセテート、シクロヘキサノン、アルコール類、水等の単体或いは混合溶媒にて溶解混合されるが、溶媒と電解質、溶媒と共役ポリマー及び電解質と共役ポリマーの相溶性が重要である。

【0040】透明電極10とベース電極14とに直流の3~6Vの電圧を印加すると、塩のカチオン、アニオンはそれぞれ陰極と陽極に移動し、近傍の共役ポリマーを電気化学ドーピングする。その結果、P型及びN型半導体を電気化学的にバランスよく生成し、共役ポリマーに電子或いは正孔を効率よく供給することになり、発光する(例えば、WO96/00968)。

【0041】このように、LECは構造がシンプルかつ、膜厚制御が容易で、低消費電力であるという特徴がある。

【0042】表示部2に、発光体層13自体の発光色を使うこともできるが、発光体層13と透明電極10の間は透明電極10を支持する基体上に設けられた透明着色層15、或いは発光体層13に接する透明電極10を着色した着色透明電極10aによって、発光色以外の所望

の色を選択することができる。透明着色層15は、カラーフィルターに用いられるアゾ顔料、ニトロソ顔料、ニトロ顔料、アリザリンレーキ等のような所望波長の透過をする色素や、ベンゾピラノン、キノリジン、エチルピリジニウムパークロレート、エチルベンズオキサゾリウムパークロレート誘導体等の色変換色素を用い、波長そのものを変換するものが使用できる。色変換は、エネルギーの高い短波長の低い長波長に変換することが効率がよい。

【0043】次に、実施の形態1に係る押釦スイッチ用部材1の製造方法について説明する。

【0044】まず、平らな透明絶縁性フィルム9を一番下にして、この透明絶縁性フィルム9のキートップ部3が位置する箇所に、キートップ部3の天面の幅とほぼ等しい帯状の透明電極10を形成し、この透明電極10の上からキートップ部3の天面部に該当する箇所を中心にして遮光性及び絶縁性を有する不透明着色インクによるネガ印刷を行うことで、キートップ部3の裏面部を除いた押釦スイッチ用部材1の外周表面を覆うに十分な大きさの不透明着色層11を形成する。この際、不透明着色層11のキートップ部3の天面部が位置する箇所には、スイッチ機能を表示した表示部2の模様部の形状を象った抜き型部12を形成しておく。

【0045】次に、不透明着色層11の上には、抜き型部12を含めたキートップ部3の天面部の大きさより僅かに小さな大きさに発光材料を印刷して発光体層13を形成する。これにより、抜き型部12には発光体層13が充填される。さらに、発光体層13の上に発光体層13とほぼ同じ大きさのベース電極14を形成して、発光体層13が不透明着色層11の抜き型部12に留まるようにすることで、賦形加工前の印刷済みシート(図示せず)が完成する。

【0046】表示部2の模様部と地部及び不透明着色層11等の形成は、通常の透明、不透明インクをスクリーン印刷、インクジェット印刷、熱転写印刷、グラビア印刷、吹き付け塗装、ディップコーティング、スピンコーティング、蒸着等の手法を用いて行えばよい。また、印刷基体の色をそのまま利用することもできる。

【0047】次に、前述した賦形加工前の印刷済みシートを圧空・真空成形やプレス成形等により所望のキートップ部3の形状に合わせた賦形加工を行い、キートップ部3の芯材22が設けられる凹部を有する賦形シートを作成する。このとき、透明電極10とベース電極14の抵抗値が大きく変化しないように、透明電極10の屈曲部は十分な丸みを確保することが必要である。

【0048】次に、賦形加工によって成形された賦形シートの凹部にベース電極14に接して酸素吸収層18とこの酸素吸収層18に接する吸湿層17とを形成した後、その上から芯材22となる熱硬化性樹脂を注入して金型内で硬化させる。その後、キートップ部3の押圧突

部8の先端に導電性インクを塗布することで可動接点7を形成して実施の形態1に係る押釦スイッチ用部材1が完成する。

【0049】透明電極10としては、所望形状になった透明絶縁性成形体、例えばアクリル樹脂を射出成形したもの等に、酸化錫、酸化インジウム、酸化亜鉛等のセラミックを電子ビーム蒸着、イオンプレーティング、スパッタリング等の手法で透明導電層を形成することができる。又は、セラミックの微粒子を透明絶縁性樹脂溶液に混合した透明導電性インクをスクリーン印刷、グラビア印刷、インクジェット印刷、スプレーコーティング、ディップコーティング、スピニング等一般的な印刷塗布方法によって、形成することができる。或いは、前記したセラミックの微粒子を透明絶縁性樹脂に混合した樹脂コンパウンドを直接成形したものであっても構わない。おおよそ、その表面抵抗は10～3000Ω/□で、光線透過率は50～90%である。

【0050】予め所望形状に成形された成形体（芯材）上に透明電極10を形成することも可能であるが、工業的利用上の便宜からは膜厚の制御等を考慮すると、予め透明絶縁性フィルム9上に透明導電層を設けることが好ましく、厚みが25～500μm程度のポリビニルアルコール、ポリエチレン、ポリエチレンテレフタレート、ポリエチレンナフタレート、ポリアクリル、ポリカーボネート、ポリスチレン、ポリフロロエチレンプロピレン、ポリクロロトリフロロエチレン、ポリビニリデン、ポリイミド、ポリアミドイミド、ポリエーテルスルホン、ポリスルホン、ポリフェニレンサルファイド、ポリアミド、ポリアリレート、或いはスチレン系、ポリエステル系、ポリアミド系熱可塑エラストマーや、それらの共重合物、アロイ等の変性物の他、数種のフィルムをラミネーションした複層品等が使用できる。

【0051】透明絶縁性フィルム9が後述する加工法により延伸されると、透明導電層である透明電極10も合わせて延伸されることから、導電性が低下するが、透明絶縁性フィルム9と同じ樹脂をバインダーとした透明導電性インクは、密着性又は加工特性が近いために好ましい。さらに、導電性フィラーを分散させた透明導電性インクは導電性フィラーの連鎖により導電性をもたらすが、延伸率が50%以上の成形体に対しては、容易に連鎖が壊れやすいため、そのもの自体が導電性である導電性ポリマーは非常に好都合である。

【0052】これら導電性ポリマーは、ポリアセチレン、ポリパラフェニレン、ポリピロール、ポリチオフェン、ポリアニリン、ポリフェニレンビニレン、ポリセレン、ポリアズレン、ポリピレン、ポリカルバゾール、ポリピリダジン、ポリナフチレン、ポリフルオレンやそれらのアルキル化やアルコキシ化等の置換基を導入したポリエチレンジオキシチオフェン、ポリチエニレンビニレン、ポリ(3メチルチオフェン)、ポリ(3, 4

ージメチルチオフェン)、ポリ(3-チオフェン-β-エタンスルフォネール)、ポリメチルピロール、ポリ(3ヘキシルピロール)、ポリ(3-メチル-4-ピロールカルボン酸メチル)、ポリシアノフェニレンビニレン、ポリジメトキシフェニレンビニレン誘導体、或いはポリイソプレン変成物等の共役系導電性ポリマーが挙げられる。

【0053】このうち、ドーパントの影響もあるが、酸素や湿度に安定性が高く、透明性があり導電性が高い、ポリピロール、ポリチオフェン、ポリアニリン誘導体が好ましい。

【0054】導電性ポリマー単体では、十分な抵抗を得ることができないため、ドーピングする必要があり、アクセプターとしてヨウ素、臭素等のハロゲン、PF<sub>5</sub>、AsF<sub>5</sub>、BF<sub>3</sub>等のルイス酸、HF、HCl、H<sub>2</sub>SO<sub>4</sub>等のプロトン酸やパラトルエンスルホン酸、パラメトキシエチルトルエンスルホン酸等の有機酸、FeCl<sub>3</sub>、TiCl<sub>4</sub>等の遷移金属化合物、テトラシアノジメタン、テトラシアノテトラアザナフタレン、クロラニル等の有機物質或いはドナーとしてのLi、Na、K等のアルカリ金属、Ca、Sr、Ba等のアルカリ金属土類等が挙げられる。

【0055】湿度、温度による安定性を高めるため、脱ドーブには注意が必要で、電解質アニオン、カチオンは避ける方がよく、導電性ポリマーとの配位結合や共重合等は固定に対し有効な方法である。特に、ドーパントをAB2型のモノマーを出発原料とし、中心核分子から順次結合させて合成された dendrimer やポリスチレン、ポリメチルメタクリレート、ポリウレタン等のオリゴマー、ポリマー或いはフラレン分子を官能基に導入し、これを担持することは簡便であり、透明絶縁性成形体やフィルムへの密着性が高まることから、特に望ましい。また、このような担体を中心に多官能となったドーパントは、導電的には、導電性ポリマー分子間をブリッジさせ、安定化し抵抗を下げることにもなるため、非常に有用である。導電性ポリマーが封止された状態では脱ドーブの影響は非常に小さくなるので、成形体中に収めるようにする方がよい。

【0056】さらに、導電性を低下させるためには、導電性ポリマーを延伸し、導電性ポリマーの分子間距離を縮めることは有用で、賦形時の延伸を利用することができる。

【0057】導電性ポリマーは、その前駆体モノマーを酸化剤や触媒を用いて重合する化学的重合法、非共役ポリマーからなる中間体を熱処理して得る方法、或いは芳香族化合物をモノマーとして電気化学的に酸化又は還元して重合する電解重合法等があるが、これに限定されるものではない。

【0058】透明絶縁性フィルム9上には、導電性ポリマーの低分子品を蒸着等で設けるか、水或いは溶剤に溶

解した状態又は分散したエマルジョン状態で、一般的な印刷塗布方法で形成することができる。その膜厚は、おおよそ0.1～25 μm程度である。導電性ポリマーの場合は膜厚と抵抗は非オーミックである場合が多く、厚くしても、それに見合った抵抗減少が得られない場合が多く、光線透過率が悪くなるだけである。そのため、前もって必要な厚みを決定しておく必要がある。

【0059】必要であれば、不透明な電極上にそれ自体が発光する表示部2を設け、さらに前述した手法で透明導電層を形成し、保護のためオーバーコート層16を設けることも可能であるが、湿度等に敏感な発光体層13を保護するためには十分な性能を有するコート層を施す必要があり、例えば透過率の低い樹脂を厚く設けることが望まれる。

【0060】透明絶縁性フィルム9の裏面に透明電極（透明導電層）10を使用する場合は、透明絶縁性フィルム9を外側にすると、連続した透明絶縁性フィルム9で表示部2を保護することができ、簡便で有用性が高い。例えば、発光色をそのまま利用する場合、透明絶縁性フィルム9、不透明着色層11、透明電極（透明導電層）10、発光体層13の順に設けることにより達成される。

【0061】発光色以外の色を利用する場合は、透明絶縁性フィルム9、不透明着色層11、着色透明電極10a、発光体層13の順で設けること等により達成される。着色透明電極10aは、導電性ポリマー又は透明導電性インクのバインダーに有機色素を少量加えて作ることができる。

【0062】エルゴノミックデザインから、複雑な3次元構造のデザインが要求され、押釦スイッチ用部材1は真空成形、ブロー成形、プレス成形等の成形方法によって賦形される。成形体の形状はおおよそ、キーピッチが5～30mm、キートップ部3の大きさが3～20mmの断面を有する四角柱又は円柱、キートップ部3の高さは2～15mmである。キートップ部3の天面部も曲率を持つものが多いが、発光する表示部に過大な変形応力を加えることは避けるべきである。

【0063】表示部2はキートップ部3の天面部近傍にあり、キートップ部3以外の押釦スイッチ用部材1の部分は、固定基板5に載置又は貼付されるため、平面形状をしている。

【0064】賦形時には、特にはキートップ部3の側面が延伸されるため、透明絶縁性フィルム9、透明電極（透明導電層）10はこれに適した材料でなければならず、破断や抵抗上昇の無いものが選ばれる。導電性ポリマーはこれに適した材料であり、特に延伸率が高い表示部2の周囲の導電性ポリマーを厚く形成し、抵抗上昇を抑えることができる。表示部2の背景部（地部）又はキートップ部3の側面が不透明の場合は、後述する導電性インクによって補うことも可能である。しかし、100

%を超えるような過度の延伸が行われた時は、抵抗が約10倍上昇する恐れがある。この場合、導電性ポリマーに線径が0.5 μm以下の微細な導電性繊維を混合することにより、導電性を維持することができる。この場合の導電性繊維のアスペクト比は、10以上望ましくは20以上、さらに望ましくは50以上がよい。

【0065】ポリアクリロニトリル系等のカーボンファイバーを裂いたもの、酸化亜鉛、チタン酸カリウム等のセラミックスウイスカーにカーボンコート又は銀メッキを施したものが挙げられるが、柔軟なものがよく、アクリル、レーヨン、ポリエステル、フェノール等の合成繊維に銀メッキ等を施したもの、或いはシングルウォールナノチューブ、マルチウォールナノチューブ等が挙げられ、ナノチューブは線径が0.2 μm以下の導電性繊維で非常に都合がよい。配合量は所望の抵抗値によって決定されるが、0.1～20 wt %である。径が細いほど及び配合量が少ないほど透明性が高いことはいまでもない。

【0066】この透明電極10と対向するベース電極14は、金、銀、銅、ニッケル、アルミニウム等の金属又は合金、或いはタングステンカーバイド、炭化珪素、酸化スズ、酸化インジウム等のセラミックスを蒸着膜で、又はフラーレンを光重合、電子線照射重合、プラズマ重合、電解重合等で形成できる。これら微粒子の他、カーボンブラック、グラファイト等の導電性フィラーをエポキシ樹脂、ウレタン樹脂、シリコン樹脂等の絶縁性樹脂溶液に混合した導電性インクによっても形成できる。

【0067】透明電極10と同様に、延伸による抵抗変化を抑えるため、絶縁性樹脂からなるバインダーを延性のあるポリアミド、ポリエステル、熱可塑性エラストマー等の分子量の大きな熱可塑性樹脂とすることは延伸性が高くなるので好ましい。さらに、熱可塑性樹脂又は熱硬化性樹脂を塑性流動状態で成形することは、バインダーを延伸して導電粒子の連鎖を破壊することがないのでより好ましい。熱可塑性樹脂の場合は、80～150℃程度の低温で塑性状態となる融点、軟化点を有するものがよい。或いは、少量の溶剤、可塑剤を加え必要ならば、賦形後乾燥させる。熱硬化樹脂の場合は未硬化状態のものをを用い、賦形後硬化させる。粘度調整、流れ調整のため、必要であれば熱可塑性樹脂と混合しても構わない。

【0068】絶縁性樹脂を導電性ポリマーとした場合は、バインダー自体も導電性となることから導電性フィラーの連鎖が壊れても導通を維持することができるので使用することも可能で、さらに、導電性繊維又は可撓性のあるカーボンナノチューブを混合した場合は、バイパス効果で抵抗を下げ維持することができるので、好ましい。

【0069】透明電極10とベース電極14との2つの対向電極は抵抗の観点から、全面に渡り設けても構わな

いが、発光体層 13、透明着色層 15、不透明着色層 11 又はその他の絶縁層によって、絶縁する必要がある。この時、成形体の基体樹脂と同じ材質を使うことは、密着性、延伸性の点から好ましい。これとは別に、表示部 2 を部分的に設ける場合は、通常のリソグラフィ法又はアディティブ法により形成することができ、非導電性ポリマー部分に導電性インクによる形成層を設けると、両者を絶縁する必要が無く、簡便で好ましい。複数の表示部 2 を選択して発光する時等、回路パターンが複雑になり、交差する場合は、ジャンパー等を設け対処する等、一般的な回路基板等の形成時に用いられる配線ルールを活用することも可能である。

【0070】押釦スイッチ用部材 1 への給電は、キートップ部 3 以外の部分にベース電極 14 の電極端子及び透明電極 10 の電極端子を設け、載置する回路基板 5 にそれと対向する位置にある電極端子とを、直接接合させ、必要ならば弾性体により押圧する方法や、キートップ部 3 の賦形時に同時に電極端子部分を加工し突起を設ける方法、或いは導電弾性体を介する方法が簡便であるが、カードエッジコネクタを用いる方法や、絶縁性接着剤に導電粒子を分散させた異方導電性接着剤等で接合する方法も選択できる。いずれにしても、ベース電極 14 の電極端子及び前記透明電極 10 の電極端子を押釦スイッチ用部材 1 のキートップ部 3 以外の部分に設けることで、表示部 2 を含めたキートップ部 3 のデザインの自由度を高めることに寄与している。

【0071】発光体層 13 の寿命は、湿度や酸素により影響されるため、成形体は有機材料でできている場合が多くガス透過があり、特別な配慮が必要である。それらの性能は水蒸気透過率が  $3 \text{ (g/m}^2/24\text{H, } 40^\circ\text{C, JIS 7129K)}$  以下、酸素透過率が  $1 \text{ (cc/m}^2/24\text{H/atm, } 0\% \text{ RH, JIS 7126K)}$  以下が必要で、発光体層 13 の寿命が 500H 以上であることが必要である。水分や酸素のバリア層としては、発光する意匠パターンを形成した成型体又はその中間材料、例えば、透明絶縁性フィルム上に酸化珪素、酸化アルミニウム、酸化マグネシウムその他の無機酸化物を真空蒸着法、スパッタリング法、イオンプレーティング法等の物理気相成長法、或いはプラズマ化学気相成長法、熱化学気相成長法、光化学気相成長法等の化学気相成長法を用いて形成できる。または、ダイヤモンド状の硬質炭素膜をプラズマ CVD 法或いはイオン化蒸着法で形成することができる。

【0072】必要ならば、予めコロナ放電処理、グロー放電処理等により粗面化したり、アルコール系、ウレタン系、エステル系のアンカーコート剤を用いることも可能である。無機酸化物を形成する場合、酸化剤としての酸素が膜中に残り易くなるため、完全酸化させず、少量の酸素で低酸化し、後ほど不活性ガスで希釈した酸素で完全化する方法は緻密な膜形成に有効的である。或い

は、メチルシラノールの単量体又は多量体のアルコール溶液を、アミノシラノールを触媒とし塗布乾燥させ、必要ならばアンカーコート剤を用いて、成形することができる。或いは、アルコキシシランの加水重合溶液を、酸又はアルカリを触媒として微粒子を含むゾル状態を作り、熟成しゲル状態を経由した後、加熱するゾルゲルコーティング法も用いることができる。

【0073】ゾルゲル法では、一部有機基が残存するため、溶剤可溶性パーヒドロポリシラザンを大気中で加熱し酸化珪素に転化すると、有機基がなく緻密な膜が形成されるので非常に有効である。ポリシラザンを気相又は液相で付着させ、室温から  $120^\circ\text{C}$  程度の温度で数分加熱し、大気中に放置することによって処理することができる。ポリシラザン法は、真空操作の工程が無く、簡便に緻密な酸化珪素層を形成することが良いので好ましい。

【0074】緻密な無機酸化物層はガス透過を抑制することができるが、無機化した表面は水分を呼び易いため、さらに表面を有機化することが望ましい。メチルシラノールを用いた場合は、表面にメチル基が向くため有効である。その他無機酸化物表面にクロロプロピルトリメトキシシランやメルカプトプロピルトリメトキシシラン等のシランカップリング剤等或いはクロロシランやアルコキシシランで有機化することが好ましい。ダイヤモンド状の硬質炭素膜の場合は、表面が炭素と水素とからなっており、撥水性が高く好ましい。

【0075】真空成形等で形成された押釦スイッチ用部材 1 は、予め中空のポケット部を設けておき、ここに成形後、熱硬化性液状樹脂等を注入し、表示部 2 を封止し、金型により所望の形状に整え、芯材 22 を形成する。この際、ポリアミド樹脂等の吸湿性の成形品やフィルム或いはシリカゲル、ゼオライト、酸化バリウム等の乾燥剤を封入し、表示部 2 が吸湿するのを防ぐ吸湿層 17 を設けることは好ましい。また、鉄粉、ビタミン C、カテコール等の酸素吸収剤の他、ポリメチルフェニルシラン等のポリシランは酸素透過性がよくかつ多くの酸素を吸収できることから効率がよく、これらの酸素吸収層 18 を設けることは特に好ましい。

【0076】〔発明の実施の形態 2〕図 2 は、この発明の実施の形態 2 に係る押釦スイッチ用部材を示している。

【0077】図 2 に示した実施の形態 2 に係る押釦スイッチ用部材 1 は、文字、符号又は図柄等による表示部 2 をキートップ部 3 の中間部に設けたものであって、表示部 2 に自発光する面発光体 4 を採用したものである。

【0078】実施の形態 2 に係る押釦スイッチ用部材 1 には、回路基板 5 上の固定接点 6 の配置に合わせてこの固定接点 6 と対向する位置に可動接点 7 を配するように弾性変形可能なドーム部 23 の内面に可動接点 7 を設けた接点シート部材 24 と、この接点シート部材 24 のドーム部 23 の中央部を押圧できる押圧突部 8 を有したキ

ートップ部3が一体に形成されている。

【0079】そこで、透明絶縁性フィルム9の表面には、所望のキートップ形状に成形された第1樹脂成形体19が一体に設けられており、透明絶縁性フィルム9の裏面には、透明電極10が設けられている。

【0080】透明電極10に裏面には、キートップ部3の天面部に当たる箇所に透明な着色インクで表示部2の模様部を形成した透明着色層15が形成されている。表示部2はキートップ部3の天面部の一部分に形成されるが、透明着色層15の裏面及び透明着色層15の周囲の透明電極10の裏面には、発光材料からなる発光体層13が設けられている。また、発光体層13の裏面には銀ペーストによるベース電極14が設けられている。ベース電極14の裏面には、吸湿層17を介してキートップ部3の裏面中央部に当たる箇所に押圧突部8を設けた芯材である第2樹脂成形体20を一体に形成している。

【0081】なお、実施の形態2における各部材の材料については、実施の形態1と同様であるため、実施の形態1の説明を参照のこと。

【0082】次に、実施の形態2に係る押釦スイッチ用部材の製造方法について説明する。

【0083】まず、透明絶縁性フィルム9の裏面のキートップ3が位置する箇所に、キートップ3の天面の幅とほぼ等しい帯状の透明電極10を形成し、この透明電極10の上に透明な着色インクで表示部2の模様部を形成する。次に、発光材料をキートップ3の裏面側の透明電極10及び表示部2の上に塗布して発光体層13を形成する。次に、発光体層13のキートップ3の裏面部中央に当たる箇所を除いて、遮光性及び絶縁性を有する絶縁性インクを発光体層13の外周部と透明電極10の上に塗布して不透明着色層11を形成する。発光体層13の上には対向電極としてベース電極14を印刷し、不透明着色層11の印刷エリア内に留める。

【0084】次に、この印刷済みシートを圧空・真空成形やプレス成形等により所望の第2樹脂成形体20の形状に合わせた賦形加工を行い、キートップ部3の芯材となる第2樹脂成形体20が設けられる凹部を有する賦形シートを作成する。

【0085】次に、賦形加工によって成形された賦形シートの凹部にベース電極14に接する吸湿層17を形成した後、その上から芯材となる熱硬化性樹脂を注入して中央部に押圧突部8を有する第2樹脂成形体20の形状を金型内で造形し硬化させる。

【0086】その後、芯材である第2樹脂成形体20の押圧突部8の先端に導電性インクを塗布することで可動接点7を形成して第1樹脂成形体19を除いた状態の押釦スイッチ用部材1を完成する。

【0087】次に、芯材である第2樹脂成形体20を形成した透明絶縁性フィルム9の対応する位置の表面側に、予め所望のキートップ形状に形成した芯材である第

1樹脂成形体19を接着固定して、押釦スイッチ用部材1を完成する。

【0088】実施の形態2にあつては、発光体層13が第1樹脂成形体19と第2樹脂成形体20との間に配置されキートップ部3の中間部の位置に設けられているため、発光体層13が外部雰囲気からより隔離された環境状態に保たれているため、酸素や湿度の影響を受けることがなく長期に使用しても発光性能が低下することがない。

10 【0089】〔発明の実施の形態3〕図3は、この発明の実施の形態3に係る押釦スイッチ用部材を示している。

【0090】図3に示した実施の形態3に係る押釦スイッチ用部材1は、文字、符号又は図柄等による表示部2をキートップ部3の中間部に設けたものであって、表示部2に自発光する面発光体4を採用したものである。

【0091】実施の形態3に係る押釦スイッチ用部材1では、透明絶縁性フィルム9は平坦な状態にあり、その表面には所望のキートップの形状に成形された第1樹脂成形体19が一体に設けられており、透明絶縁性フィルム9の裏面には、透明電極10が設けられている。透明絶縁性フィルム9と第1樹脂成形体19との間には、透明な酸素吸収層18が形成されている。

【0092】透明電極10に裏面には、キートップ部3の天面部に当たる箇所に透明な着色インクで表示部2の模様部を形成した透明着色層15が形成されている。表示部2はキートップ部3の天面部の一部分に形成されるが、透明着色層15の裏面及び透明着色層15の周囲の透明電極10の裏面には、発光材料からなる発光体層13が設けられている。そして、発光体層13の側面部と透明電極10の裏面には、遮光性及び絶縁性を有する不透明着色層11が設けられている。また、発光体層13の裏面及び不透明着色層11の端面を覆うようにして銀ペーストによるベース電極14が設けられている。ベース電極14の裏面には、キートップ部3の裏面中央部に当たる箇所に押圧突部8を設けた芯材である第2樹脂成形体20を一体に形成している。ベース電極14と第2樹脂成形体20との間には、吸湿層17が形成されている。

40 【0093】なお、実施の形態3における各部材の材料及び説明のない他の部材については、実施の形態1又は2と同様であるため、同一の構成には同一の符号を付してそれらの説明を省略する。

【0094】次に、実施の形態3に係る押釦スイッチ用部材の製造方法について説明する。

【0095】まず、透明絶縁性フィルム9の裏面の芯材である第2樹脂成形体20が位置する箇所に、第1樹脂成形体19の天面の幅とほぼ等しい帯状の透明電極10を形成し、この透明電極10の上に透明な着色インクで表示部2の模様部を形成する。次に、発光材料をキート



ップ3の裏面側の透明電極10及び表示部2の上に塗布して発光体層13を形成する。次に、遮光性及び絶縁性を有する絶縁性インクを発光体層13の外周部と透明電極10の上に塗布して不透明着色層11を形成する。発光体層13の裏面には、対向電極としてベース電極14を印刷し、不透明着色層11の印刷エリア内に留める。ベース電極14の裏面には、吸湿層17を介して中央部に押圧突部8を設けた芯材である第2樹脂成形体20を一体に形成する。

【0096】次に、芯材である第2樹脂成形体20を形成した透明絶縁性フィルム9の対応する位置の表面側に、予め所望のキートップの形状に形成し、透明絶縁性フィルム9と接する部分に酸素吸収層18を設けた芯材である第1樹脂成形体19を接着固定して、押釦スイッチ用部材1を完成する。

【0097】実施の形態3にあっては、発光体層13が第1樹脂成形体19と第2樹脂成形体20との間に配置されキートップ部3の中間部の位置に設けられているため、発光体層13が外部雰囲気からより隔離された環境状態に保たれているため、酸素や湿度の影響を受けることがなく長期に使用しても発光性能が低下することがない。また、透明絶縁性フィルム9、透明電極10、不透明着色層11及びベース電極14が平坦な状態のままであるので、キートップ部3の賦形加工が不要であるため、透明電極10及びベース電極14の導電性の劣化が生じることがない。

【0098】ところで、実施の形態1乃至実施の形態3にも種々の表示部2のデザインが考えられ、その代表的なものを図4乃至図13に示した。

【0099】図4に示した表示部2の第1の態様は、上から順番に無機酸化物層21、透明絶縁性フィルム9、透明電極10、抜き型部12を有する不透明着色層11、抜き型部12を埋める透明着色層15、発光体層13及びベース電極14を有している。ここで、透明着色層15が模様部を形成し、不透明着色層11が地部を形成している。

【0100】図5に示した表示部2の第2の態様は、上から順番に無機酸化物層21、透明絶縁性フィルム9、透明電極10、模様部を形成する不透明着色層11、地部を構成する透明着色層15、発光体層13及びベース電極14を有している。

【0101】図6に示した表示部2の第3の態様は、上から順番に無機酸化物層21、透明絶縁性フィルム9、透明電極10、抜き型部12を有する地部を構成する不透明着色層11、抜き型部12を埋めて模様部を形成する発光体層13及びベース電極14を有している。

【0102】図7に示した表示部2の第4の態様は、上から順番に無機酸化物層21、透明絶縁性フィルム9、透明電極10、模様部を形成する透明着色層15と地部を形成する第2透明着色層15a、発光体層13及びベ

ース電極14を有している。

【0103】図8に示した表示部2の第5の態様は、上から順番に無機酸化物層21、透明絶縁性フィルム9、抜き型部12を有する地部を構成する不透明着色層11、抜き型部12に入り込み模様部を形成する着色透明電極10a、着色透明電極10aを介して抜き型部12を埋める発光体層13及びベース電極14を有している。

【0104】図9に示した表示部2の第6の態様は、上から順番に無機酸化物層21、透明絶縁性フィルム9、模様部を形成する透明着色層15と地部を形成する不透明着色層11、透明電極10、発光体層13及びベース電極14を有している。

【0105】図10に示した表示部2の第7の態様は、上から順番に無機酸化物層21、透明絶縁性フィルム9、模様部を構成する不透明着色層11、不透明着色層11の外周を覆い地部を構成する着色透明電極10a、発光体層13及びベース電極14を有している。

【0106】図11に示した表示部2の第8の態様は、上から順番に無機酸化物層21、透明絶縁性フィルム9、模様部を構成する不透明着色層11と地部を構成する透明着色層15、透明電極10、発光体層13及びベース電極14を有している。

【0107】図12に示した表示部2の第9の態様は、上から順番にキートップ部3を被覆する無機酸化物層21、芯材である第1樹脂成形体19、オーバーコート層16（透明絶縁層）、型抜き部12を有し地部を構成する不透明着色層11、模様部を構成する透明電極10、発光体層13、ベース電極14及び不透明絶縁性基礎体22を有している。

【0108】図13に示した表示部2の第10の態様は、上から順番にキートップ部3を被覆する無機酸化物層21、芯材である第1樹脂成形体19、オーバーコート層16（透明絶縁層）、型抜き部12を有し地部を構成する不透明着色層11、模様部を構成する透明着色層15、透明絶縁性フィルム9、透明電極10、発光体層13及びベース電極14を有している。

【0109】このうち、図4、図6、図7、図8、図9、図12及び図13に示したものは、文字、符号又は図柄等からなる模様部が発光するものであり、図5、図10及び図11に示したものは、文字、符号又は図柄等以外の地部が発光するものである。また、図8と図10に示したものは、透明電極10を着色して透明着色電極10aとしたものであり、この場合には透明着色層15を使用しなくてよいため、製造工程が簡単となり製造コストが低減できる。

【0110】なお、透明着色層15と不透明着色層11とは、軟質の樹脂やエラストマーをバインダーにし、染料や顔料を混合したもので、透明絶縁性フィルム9に密着し、同じく延伸性のあるものがよく、透明絶縁性フィ

ルム9と同様に樹脂を用いることが好ましい。

# 【0111】

【実施例】【実施例1】実施例1は、この発明の実施の形態1に対応するものである。

【0112】まず、100 $\mu$ mのポリメチルメタクリレート（アクリレン、三菱レーヨン（株）製）の片面にスルホン化ポリスチレンをドーピングしたポリ（3，4-エチレンジオキシチオフェン）（デナトロン4001、長瀬産業（株）製）溶液にその固形分に対し3%のマルチウォールナノチューブ（線径0.01 $\mu$ m、平均線長5 $\mu$ 、ハイペリオン社製）をホモジナイザーを用い分散させ透明な処理液を得た。

【0113】処理液をフィルムの片面にグラビアコーターにより全面塗布し、1 $\mu$ m厚の透明電極を形成した。このものの全光線透過率70%（JIS-K7105）で、表面抵抗500 $\Omega$ /□（JIS-K6911）であった。不透明着色層11を遮蔽性のある絶縁性で黒色の着色インクで表示部2の地部をスクリーン印刷で、表示部2及びベース電極14の端子部を除き全面に塗布した。ポリ（2-メトキシ-5-エチルヘキシルオキシ）-1，4-フェニレンビニレンとポリエチレンオキサイドとトリフロロメタンスルホン酸リチウム塩とシクロヘキサノンとエチルアルコールからなるLECインクを地部の開口部分最小限に同様に印刷で18 $\mu$ mの発光体層13を、ついで銀ペースト（ドデントNH-030A、熱可塑性ポリアミドバインダー、ニホンハンダ（株）製）で発光体層13上に対向電極となるベース電極14とそれに繋がる端子電極を不透明着色層11に設けた。この印刷工程終了後、真空乾燥装置でよく乾燥させ印刷フィルムを得た。

【0114】直径12mm、深さ7.8mm、底面R50mmの凹曲面を有する12個のキャビティーを有する金型と、これにより型取りした硬度90度（ショアーA）の弾性体からなる雄型を用い、表示部に断熱のため直径8mmの金属片を置き、赤外線により110℃に加熱し、金属片を取り去り直ちに、印刷フィルムを冷間で圧縮成形した。

【0115】雄型を取り除いた後、芯材22として酸化バリウム粉末を混合したポリメチルフェニルシランと液状エポキシ樹脂を必要量注塑し、図1に示す断面形状を有する第2の雄型により、芯材22に押圧突部8を成形した。

【0116】次に、電極端子をマスクし、酸素雰囲気中でアルミニウムをイオンプレーティング法により処理し、成形体表面に酸化アルミニウムを形成し、トリメトキシシランを気相法により付着形成し、押釦スイッチ用部材1を得た。

【0117】押釦スイッチ用部材1の電極端子と回路基板5上の電極端子とを合わせて載置し、発光体層13に直流6Vを印加すると表示部2は全て発光を呈し、輝度

は62ニトで、半減期は1225Hであった。

【0118】【実施例2】実施例2は、この発明の実施の形態1に対応するものである。

【0119】まず、100 $\mu$ mのポリメチルメタクリレート（アクリレン、三菱レーヨン（株）製）の片面にポリアニリンにその構造単位の1/6モルのスルホン化デンドリマー（DSM社のジアミノブタンとシアノエチレンを出発物質としたデンドリマー商品名DAB（PA）8の1モルに、ベンゼンスルホン酸8モルを反応させたもの）を混合したDMF溶液に、その固形分に対し3%のマルチウォールナノチューブ（線径0.01 $\mu$ m、平均線長5 $\mu$ 、ハイペリオン社製、）とアゾ染料（パーマネントレッド4R、山陽色素（株）製）を固形分に対して0.1wt%添加し、ホモジナイザーを用い分散させ透明な赤色の処理液を得た。

【0120】処理液をフィルムの片面にグラビアコーターにより全面塗布し、1 $\mu$ m厚の赤い透明電極10を形成した。さらに、着色されていない導電性ポリマー溶液を表示部2の周囲に1 $\mu$ mスクリーン印刷により塗布した。このものの全光線透過率は72%（JIS-K7105）で、表面抵抗は600 $\Omega$ /□（JIS-K6911）であった。不透明着色層11を遮蔽性及び絶縁性のある黒色の着色インクで表示部2の地部をスクリーン印刷で、表示部2及びベース電極14の電極端子部を除き全面に塗布した。ポリ（2-メトキシ-5-エチルヘキシルオキシ）-1，4-フェニレンビニレンとポリ（9，9-ジ-*n*-ヘキシルフルオレン-2，7'-ジイル）とポリエチレンオキサイドとトリフロロメタンスルホン酸リチウム塩とシクロヘキサノンとエチルアルコールからなるLECインクを地部の開口部分最小限に同様に印刷で20 $\mu$ mの発光体層13を形成した。

【0121】次に、ビニル基0.15モル%含むポリジメチルシロキサン（KE-78VBS、信越化学工業（株）製）に銀粉末（シルコート、福田金属箔粉工業（株）製）を固形分に対し75wt%含むケロシン溶液からなる導電性インキで、発光体層13上に厚み50 $\mu$ mの対向電極とそれに繋がる電極端子を不透明着色層11に設けた。この印刷工程終了後、60℃の真空乾燥装置でよく乾燥させ印刷フィルムを得た。

【0122】実施例1と同様の金型で圧縮成形を行い、キートップ部3を賦形すると、この未加硫シリコンゴムからなる導電性インキも透明絶縁性フィルム9の延伸とともに流動し、賦形させた。

【0123】芯材22として合成ゼオライト粉末と鉄粉とベンゾイルパーオキサ이드を混合したビニルエステル樹脂（デラーケン411、ダウケミカル（株）製）を約0.3cc注塑し、120℃でシリコンゴムと共に反応させ、60℃の真空乾燥装置でよく乾燥させた。さらに、ベンゾイルパーオキサイドを含むビニルエステル樹脂を必要量注塑し、図1に示す断面形状を有する第2の

雄型により、芯材22に押圧突部8を成形した。

【0124】電極端子をマスクし、ポリシラザン蒸気に25℃5分間あて、気相法で付着さ、一昼夜、25℃50%RHの層に保存して緻密な酸化ケイ素に転化させた。さらに、この成形体をメルカプトプロピルトリメトキシシランのアルコール溶液(固形分1wt%)に漬、直ちに乾燥させ、押釦スイッチ用部材1を得た。

【0125】押釦スイッチ用部材1の電極端子と回路基板5上の電極端子とを合わせて載置し、発光体層13に直流6Vを印加すると表示部2は全て発光を呈し、輝度は60ニトで半減期は1360Hであった。

【0126】〔実施例3〕実施例3は、この発明の実施の形態2に対応するものである。

【0127】まず、250μmのポリエチレンテレフタレート(ルミラー、東レ(株)製)の片面にインジウム錫酸化物を、一方に酸化ケイ素をイオンプレーティング法により、透明電極10と無機酸化物層21をそれぞれ全面に形成した。このものの全光線透過率は80%(JIS-K7105)で、表面抵抗は100Ω/□(JIS-K6911)であった。

【0128】熱可塑性ポリエステル(スタフィックスPLC、富士写真フィルム工業(株)製、)に色変換色素としてキノリジン誘導体(NKX-1768、感光色素研究所(株)製)を混合し、透明着色層用のインクを調整した。透明電極10上に、スクリーン印刷により透明着色層15を印刷した。

【0129】次いで、ポリ[9-(3,6,9-トリオキサデシル)-カルバゾール-3,6-ジイル]とオキシエチレンシクロトリスホスファゼンとトルエンスルホン酸ナトリウム塩とピリジンとからなるLECインクで、透明着色層15を覆うようにインクジェット印刷で1.5μmの発光体層13を形成した。

【0130】次に、実施例1と同様の黒色インクで、発光体層13の中央部と電極端子を除く部分にスクリーン印刷で絶縁層を形成し、真空乾燥装置でよく乾燥させ印刷フィルムを得た。電極端子部分をマスクし、アルミニウムを蒸着し、さらにその上にカーボンインクからなる導電層を形成した。

【0131】図2に示すものと同じ断面形状を有する雄型により、芯材である第2樹脂成形体20に押圧突部8を成形し、さらにアクリル樹脂からなるキートップ部3を二液性アクリル接着剤で貼着し、押釦スイッチ用部材1を得た。

【0132】押釦スイッチ用部材1の電極端子と回路基板5上の電極端子とを合わせて載置し、発光体層13に直流5Vを印加すると表示部2は全て発光を呈し、輝度は75ニトで、半減期は1300Hであった。

【0133】〔実施例4〕実施例4は、この発明の実施の形態3に対応するものである。

【0134】まず、透明絶縁性フィルム9として、両面

プラズマ処理を施した100μmのポリプロピレンフィルムの両面に15μmのエチレンビニルアルコールコポリマーフィルムをラミネートした。緑色の不透明着色インクで表示部2の地部をスクリーン印刷で、表示部2を除き全面に塗布した。その上に、ポリ(3,4-エチレンジオキシチオフェン)の構造単位の1/6モルのスルホン化フラーレン(C60及びC70の混合フラーレン、MER社製)と発煙硫酸を反応させたドーパントを含むポリ(3,4-エチレンジオキシチオフェン)溶液をインクジェット印刷により表示部2とそれに繋がる電極端子を形成した。さらに、実施例1で使用した銀ペーストを表示部2の周囲から電極端子部まで、この形成されたポリチオフェン層を覆うように5μmのベース電極14を印刷した。透明電極10の全光線透過率は65%(JIS-K7105)で、表面抵抗は500Ω/□(JIS-K6911)であった

ポリ(p-フェニレン-2,6-ベンゾイミダゾール)とポリエチレンオキサイドとトルエンスルホン酸リチウム塩とからなるLEC用インクを同様にインクジェット印刷により、透明電極10を覆うように、厚さ2.0μmの発光体層13を形成した。次いで、融点86℃の熱可塑性ポリエステル(バイロンGV100、東洋紡(株)製)と銀粉末を混合した導電性インクで、発光体層13のベース電極14とそれに繋がる電極端子を、キートップ部3の表示部2の形成層から離して形成した。この印刷工程終了後、真空乾燥装置でよく乾燥させ印刷フィルムを得た。

【0135】3mm×5mm、深さ1mmの底面が平坦な有する15個のキャビティーを有する雌型と2.8mm×4.8mm、高さ0.9mmの天面が平坦な形状を有する雄型を用い、表示部2に断熱のため2.6mm×4.6mmの金属片を置き、赤外線により120℃に加熱し、金属片を取り去り直ちに、印刷フィルムを冷間で圧縮成形を行った。キートップ部3を賦形すると、熱可塑性ポリエステルからなる導電性インクも透明絶縁性フィルム9の延伸とともに流動し、賦形された。

【0136】雄型を取り除いた後、酸素除去剤として50wt%の鉄粉を含む液状エポキシ樹脂を必要量注型し、図3に示すものと同じ断面形状を有する第2の雄型により、芯材である第2樹脂成形体20に押圧突部8を成形した。さらに、アクリル樹脂からなるキートップ部3を二液性アクリル接着剤で貼着した。得られた成形体の電極端子をマスクして、アミノシラノールを触媒とするフェニルシラノール溶液にディップし直ちに40℃で乾燥、反応させ、成形体表面に2μm厚のシリカ層を形成し、均一な押釦スイッチ用部材1を得た。

【0137】押釦スイッチ用部材1の電極端子と回路基板5上の電極端子とを合わせて載置し、発光体層13に直流4Vを印加すると表示部2は全て発光を呈し、輝度は65ニトで半減期は2300Hであった。

## 【0138】

【発明の効果】以上説明してきたように、請求項1に記載された発明によれば、回路基板上の固定接点に対向して配置される可動接点を前記固定接点に接触させる方向に押圧するためのキートップ部と、該キートップ部を所定の位置に配して前記回路基板上に取り付けるためのカバー基材とを有し、前記キートップ部には、スイッチ機能を表示する表示部と、該表示部に一体の面発光体とを有する押釦スイッチ用部材であって、前記面発光体が電気化学発光体であるので、直流を印可することで表示部自体が電気化学発光し、デザインの的にも視認性が高く、低消費電力で、インバータ等の余分な部品、部材を必要としないことから、軽薄短小の構造が実現でき、しかも優れた経済性をもたらす押釦スイッチ用部材を提供することができる。

【0139】請求項2に記載の発明によれば、前記キートップ部は、芯材と該芯材を被覆する透明絶縁性フィルムとを有し、前記面発光体は、ベース電極と該ベース電極に対向する透明電極との間に発光体層を有し、前記ベース電極の電極端子及び前記透明電極の電極端子を前記キートップ部以外の部分まで延長して配置したので、請求項1の効果に加え、表示部を含めたキートップ部のデザインの自由度が高まるため、押釦スイッチ用部材に対する多様なデザインのニーズに対応できる。

【0140】請求項3に記載の発明によれば、ベース電極が導電性粒子と絶縁性樹脂とからなる導電性インクであるので、請求項2の効果に加え、ベース電極にキートップ部の賦形時に生じる引っ張り力が作用してもその延伸性により導電特性を維持することができるため、スイッチ機能の信頼性が高まる。

【0141】請求項4に記載の発明によれば、透明電極は透明絶縁性基体に透明導電性ポリマー層を形成してなり、該透明電極上に接して発光層体が形成されているので、請求項2の効果に加え、透明電極にキートップ部の賦形時に生じる引っ張り力が作用してもその延伸性により導電特性を維持することができるため、スイッチ機能の信頼性が高まる。

【0142】請求項5に記載の発明によれば、透明導電性ポリマー層が着色されているので、請求項4の効果に加え、表示部を構成する部材を少なくすることができるから製造コストを低減することができる。

【0143】請求項6に記載の発明によれば、押釦スイッチ用部材の外周表面の少なくとも一部分に無機酸化物層が形成されているので、請求項1乃至5のいずれか1つの効果に加え、湿度や酸素の透過を抑制することができるため、発光体層の品質を良好に保つことができる。

【0144】請求項7に記載の発明によれば、前記無機酸化物層の外表面にさらに有機物層を設けてなるので、請求項6の効果に加え、無機化した表面の吸水性を抑制することができるため、より発光体層の品質を良好に保

つことができる。

【0145】請求項8に記載の製造方法の発明によれば、無機酸化物層がポリシラザンを転化してなるものであるので、請求項6又は7の効果に加え、アルコキシ基等の有機基がなく緻密な膜が形成されるため、より一層発光体層の品質を良好に保つことができる。

【0146】請求項9に記載の発明によれば、キートップ部の裏面部の心材と無機酸化物層の間に吸湿層を設けたので、請求項6乃至8のいずれか1つの効果に加え、湿度の透過を効果的に抑制できるため、発光体層の品質を良好に保つことができる。

【0147】請求項10に記載の発明によれば、キートップ部の裏面部の心材と無機酸化物層の間に酸素吸収層を設けたので、請求項9に記載の効果に加え、酸素の透過を積極的に抑制できるため、より発光体層の品質を良好に保つことができる。

【0148】請求項11に記載の発明によれば、ベース電極が導電性粒子と絶縁性樹脂とからなる導電性インクによって形成され、塑性流動状態で賦形したので、キートップ部の賦形時に該導電性インクに引っ張り力が作用することがほとんどなくなるため、ベース電極の導電性能が落ちることがない。

【0149】請求項12に記載の発明によれば、発光体層、透明電極、ベース電極或いは表示部の模様部又は地部を構成する着色層のうち、少なくとも3種を平面状の透明絶縁性フィルム上に形成した後、キートップ部を賦形してなるので、従来の2次成形加工と異なりキートップ部の賦形時に押釦スイッチ用部材の構成部材に引っ張り力が作用することがほとんどなくなるため、ベース電極及び透明電極の導電性能が落ちることがなく、品質の高い照光機能を有する押釦スイッチ用部材を提供することができる。

## 【図面の簡単な説明】

【図1】この発明の実施の形態1に係る押釦スイッチ用部材を示した要部断面図である。

【図2】同実施の形態2に係る押釦スイッチ用部材を示した要部断面図である。

【図3】同実施の形態3に係る押釦スイッチ用部材を示した要部断面図である。

【図4】この発明に係る押釦スイッチ用部材の表示部の第1の態様を示した要部断面図である。

【図5】同表示部の第2の態様を示した要部断面図である。

【図6】同表示部の第3の態様を示した要部断面図である。

【図7】同表示部の第4の態様を示した要部断面図である。

【図8】同表示部の第5の態様を示した要部断面図である。

【図9】同表示部の第6の態様を示した要部断面図であ

る。

【図10】同表示部の第7の態様を示した要部断面図である。

【図11】同表示部の第8の態様を示した要部断面図である。

【図12】同表示部の第9の態様を示した要部断面図である。

【図13】同表示部の第10の態様を示した要部断面図である。

【図14】従来の光源に発光ダイオードを使用した押釦スイッチ用部材の要部断面図である。

【図15】従来の光源に電球を使用した押釦スイッチ用部材の要部断面図である。

【図16】従来の導光部材を採用した押釦スイッチ用部材の要部断面図である。

【図17】従来の光源にELシートを使用した押釦スイッチ用部材の要部断面図である。

【符号の説明】

1 押釦スイッチ用部材

2 表示部

3 キートップ部

4 面発光体

5 回路基板

6 固定接点

7 可動接点

8 押圧突部

9 透明絶縁性フィルム

10 透明電極

11 不透明着色層（絶縁層）

12 抜き型部

13 発光体層（絶縁層）

14 ベース電極

15 透明着色層（絶縁層）

17 吸湿層

18 酸素吸収層

19 第1樹脂成形体（芯材）

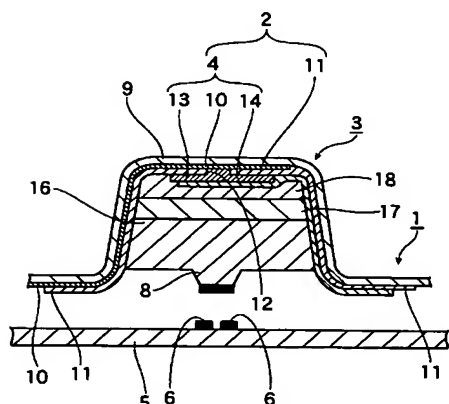
20 第2樹脂成形体（芯材）

21 無機酸化物層

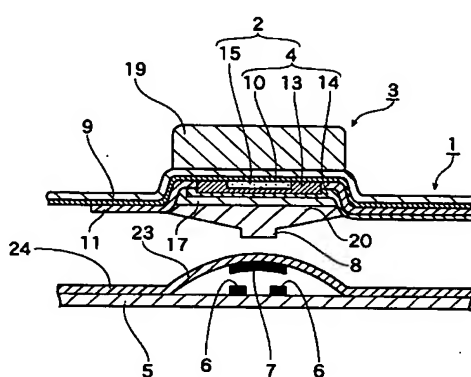
22 芯材

20

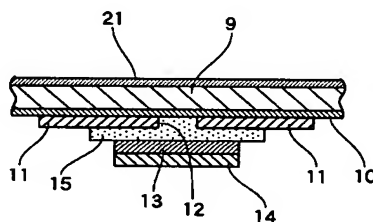
【図1】



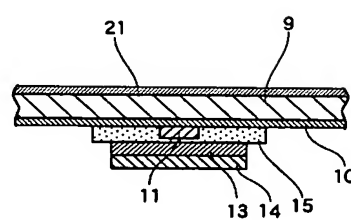
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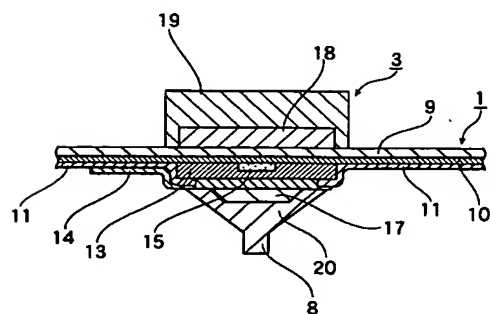
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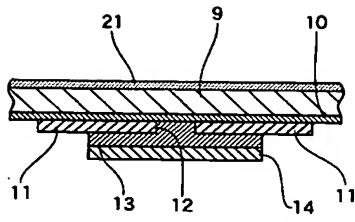
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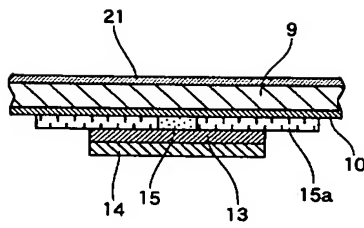
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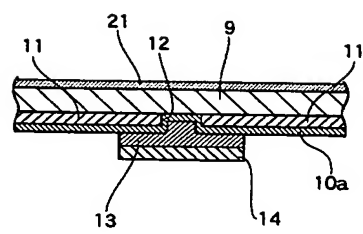
【図6】



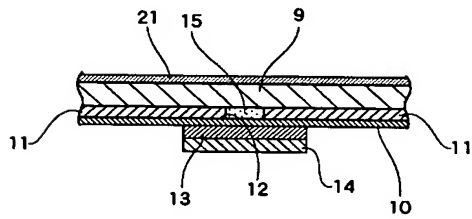
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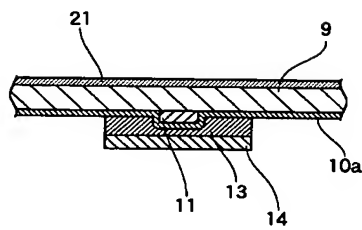
【図8】



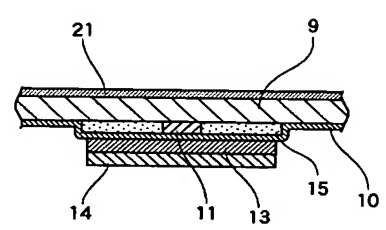
【図9】



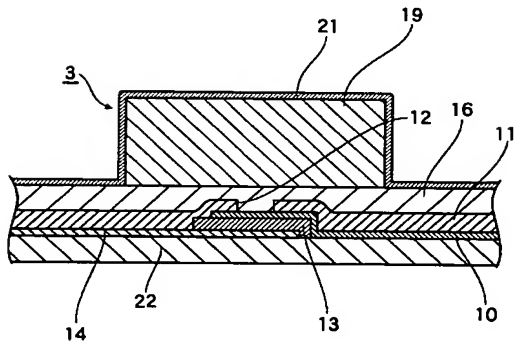
【図10】



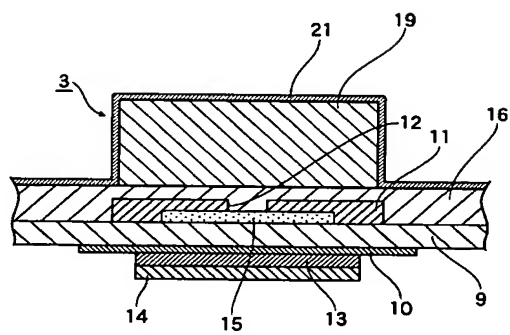
【図11】



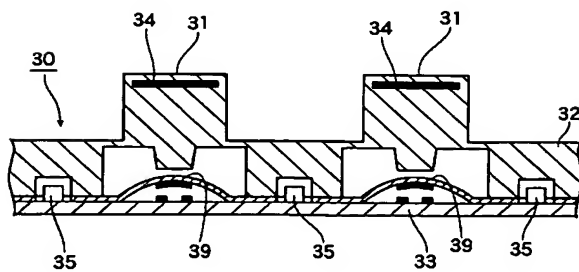
【図12】



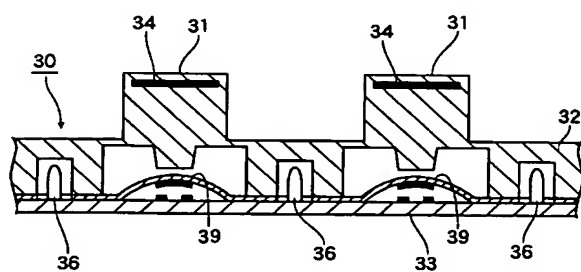
【図13】



【図14】

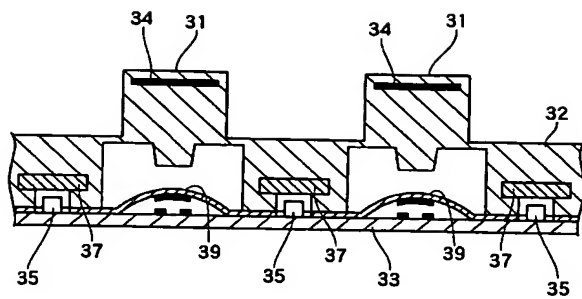


【図15】

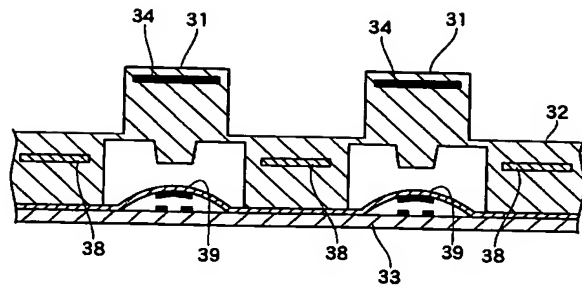




【図16】



【図17】



フロントページの続き

Fターム(参考) 5G006 FB17 JA01 JB08  
 5G023 AA20 CA30 CA50  
 5G052 AA22 BB01 JA02 JA08 JB02  
 JC04